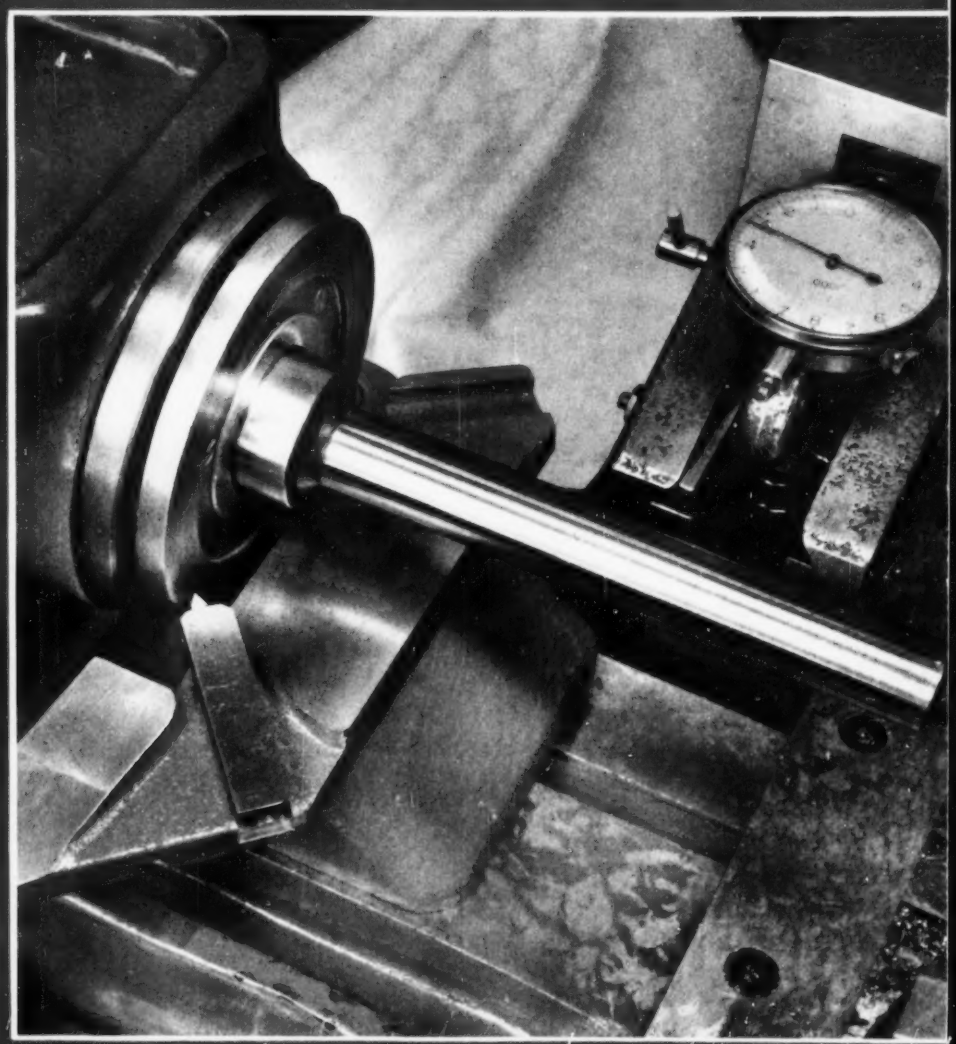
dup

Diesel Power

& Diesel Transportation



Tool and Maintenance Number

The Steel Industry Needs Scrap— *Keep it Moving*

Our 29th Year

OCTOBER, 1951

ENGINES COST LESS TO RUN... when

TUNE IN . . .
TEXACO STAR THEATER
starring
MILTON BERLE
on television
every Tuesday night.
See newspaper for
time and station.

TEXACO

TEXACO

DIESEL POWER and DIESEL TRANSPORTATION for October, 1951, Vol. XXIX, No. 10. It is published monthly by Diesel Publications, Inc., Orange, Conn. Executive and Editorial offices at 192 Lexington Ave., New York 16, N. Y. Subscription rates: United States, $3.00 per year, single copies 35c; Canada $4.00; Foreign $5.00 per year. Entered as second class matter April 29, 1949 at the Post Office, Orange, Connecticut under Act of March 3, 1879.

lubricated with

TEXACO URSA OIL

Diesel, gas and dual-fuel engines run smoother, produce more power and cost less to maintain when you lubricate them with *Texaco Ursa Oil*. Power-robbing carbon, gum and sludge don't have a chance to form because *Texaco Ursa Oil* keeps engines *clean*. Rings stay free, ports stay clear and valves function properly . . . assuring better compression and combustion . . . less fuel consumption.

Texaco Ursa Oil resists oxidation . . . stands up under extreme heat and pressure . . . assures longer parts life. Switch to *Texaco Ursa Oil* and join operators everywhere who report increased power and worthwhile maintenance savings.

There is a complete line of Texaco Diesel lubricating oils, available in every needed viscosity, and approved by leading engine builders. These oils are No. 1 in popularity. For example:

> More stationary Diesel h.p. and more railroad Diesel locomotives in the U. S. are lubricated with Texaco than with any other brand.

Let a Texaco Lubrication Engineer work with you to cut down costs throughout your plant. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write:

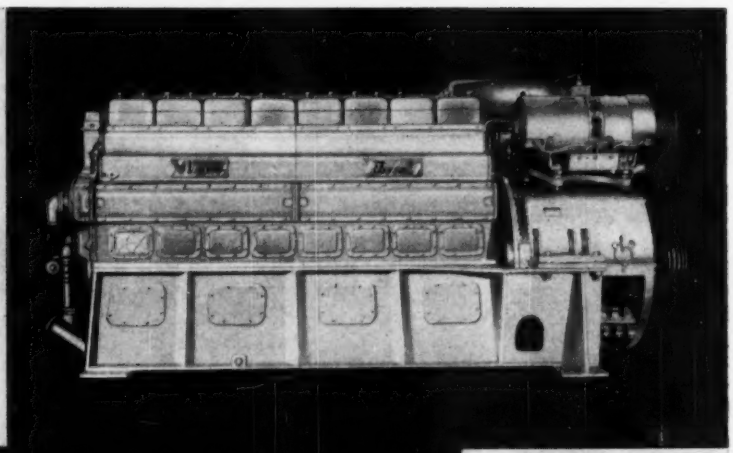
The Texas Company, 135 East 42nd Street, New York 17, N. Y.

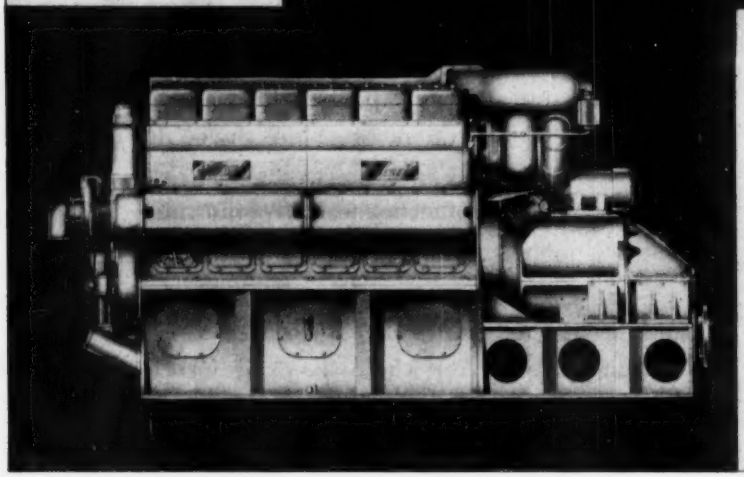
Photo courtesy Fairbanks, Morse & Co.

URSA OILS **FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES**

50 YEARS

OF EXPERIENCE AND PROGRESS





ABOVE

Sterling Viking Diesel 8 cylinder generator set rated at 600 KW.

LEFT

Sterling Viking Diesel 6 cylinder marine engine with reverse gear, rated at 665 HP in continuous service.

●

Descriptive bulletins on these and other Sterling Viking Diesel engines from 150 to 1000 BHP will be sent on request.

POWER to move ships and trains, to operate machinery or to light airports, means much more than merely installing an engine.

Fifty years of experience...broad and successful experience in applying power to just about every conceivable use is one of the reasons why Sterling engines are held in such high regard the world over.

Engineering progress is a second reason for Sterling preference. The best evidence of what constitutes success in engine design and performance is when customers come back for more.

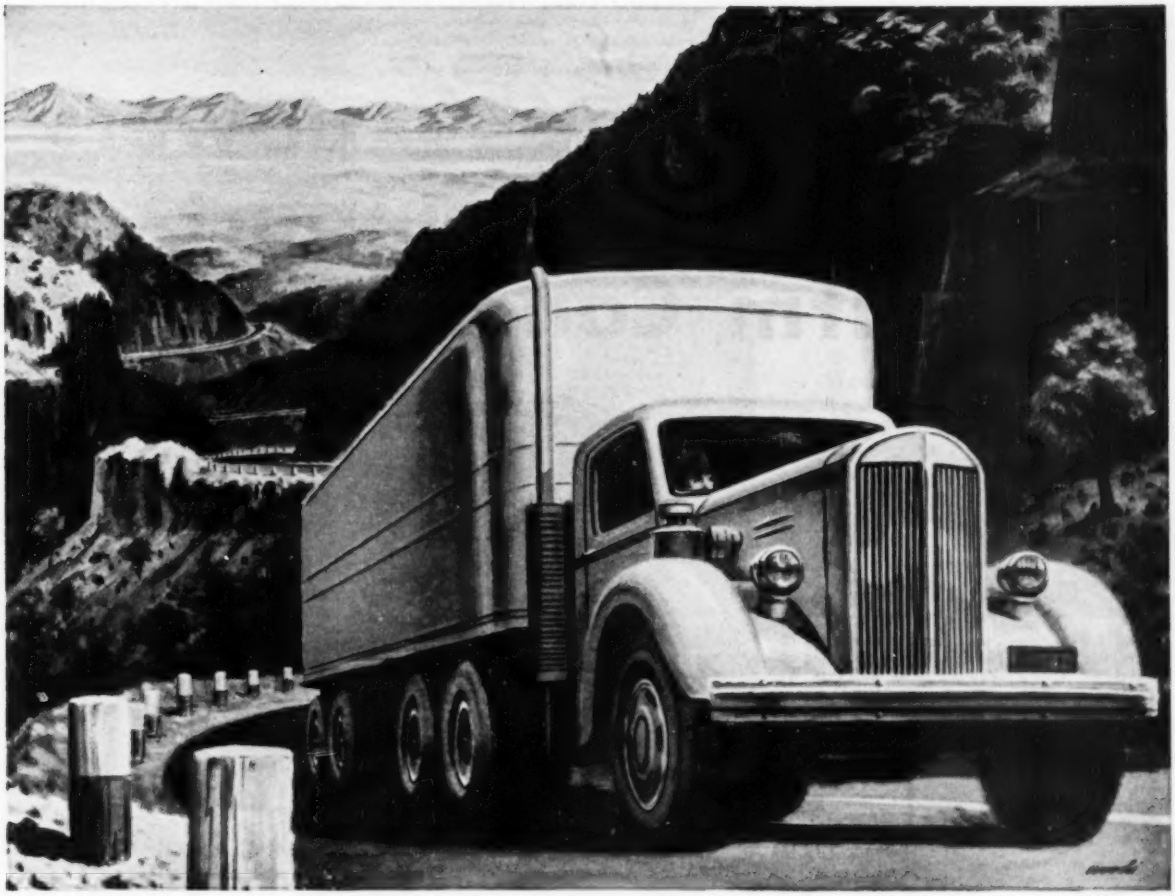
We have the present day orders, facts and figures to show every marine and industrial user of power that Sterling's first 50 years marks just the beginning. *Talk to a Sterling Engineer.*

Sterling

MARINE AND INDUSTRIAL ENGINES

● Depend upon Sterling Diesel Power for Locomotives, Generator Sets, Commercial and Fishing Craft, Lift Bridges, Ventilating Systems, Drilling Rigs, Etc.

STERLING ENGINE COMPANY • 1270 Niagara Street • Telephone Lincoln 0382 • Buffalo 13, New York



tough jobs—EVERYWHERE demand AMERICAN BOSCH performance

Hauling heavy loads through broiling desert heat and cold mountain passes is all in the day's work for many over-the-road truckers. Dependable, fast schedules are their stock in trade—and that's why you'll find American Bosch products on the job.

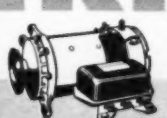
Many of the Diesel engines used to furnish the tremendous lugging power in these operations are equipped with American Bosch fuel injection systems—pumps, governors and nozzles that deliver the fuel . . . precisely timed and accurately metered to each engine cylinder, pressure atomized for maximum combustion efficiency.

Other American Bosch products, too, contribute to performance and safety—heavy duty generators and voltage regulators that furnish the required current for batteries and the numerous electrical accessories—electric windshield wipers that provide constant clear vision for drivers regardless of engine speed or load.

Over 40 years of pioneering design, precision manufacture and thoroughgoing service have built the American Bosch reputation for dependability in the toughest going. Continuous research, development and field engineering assure that this reputation will grow even stronger through the years. American Bosch Corporation, Springfield 7, Mass.

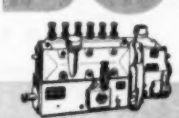
AMERICAN BOSCH

Top quality Magnetos for over 40 years.



High-performance, trouble-free Generators and Regulators.

Continuous-action, all-electric Windshield Wipers.



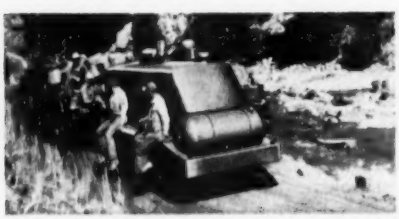
Standard of excellence in Diesel Fuel Injection Equipment.

Precision components for aircraft engines.

GM DIESEL powers world's most compact 600 cfm Compressor

CONSTRUCTION—"Starts like a charm, even on the coldest morning. No time wasted in getting up to pressure. Runs a heavy pile driver with ease. We can set it out of the way with a crane and move it back to the roadway for towing in no time."

QUARRYING AND MINING—"We couldn't imagine 600 feet coming from such a slick little compressor until we saw the increased drill footage, and the ease with which it took over two FM-2 wagon drills. Good fuel economy, too."



HIGHWAY BUILDING—"Plenty of reserve—full capacity at 6,730 feet altitude. We're operating eight 55-lb. blower drills putting in 20-ft. holes on cliffsides. So easy to maneuver and work with that it's a natural for tough jobs like this."

WINNING acclaim as the world's smallest, lightest, big-capacity portable compressor, the new Ingersoll-Rand Gyro-Flow 600 is powered by a 6-cylinder General Motors Series 71 Diesel engine.

This compact, high-powered portable delivers a full 600 cubic feet of air per minute at a steady 100-lb. pressure, yet it weighs only 9,500 pounds. It is 20 to 40% lighter—and as much as 20% smaller—than other portables of comparable capacity.

Being 2-cycle, GM Diesel engines pack more power in less space. They start quickly on their own fuel, run smoothly and enable equipment to maintain rated performance at high altitudes. They're designed for ease of maintenance—no high-pressure fuel tubing—unit injectors that can be changed in a matter of minutes. And, when needed, low-cost "Factory-Engineered" parts are readily obtainable.

These modern 2-cycle Diesels are bringing new economy and efficiency to more than 500 different kinds of power equipment built by 120 manufacturers. Ask your GM Diesel distributor or write us for full details.

ANSWER THE CALL CIVIL DEFENSE

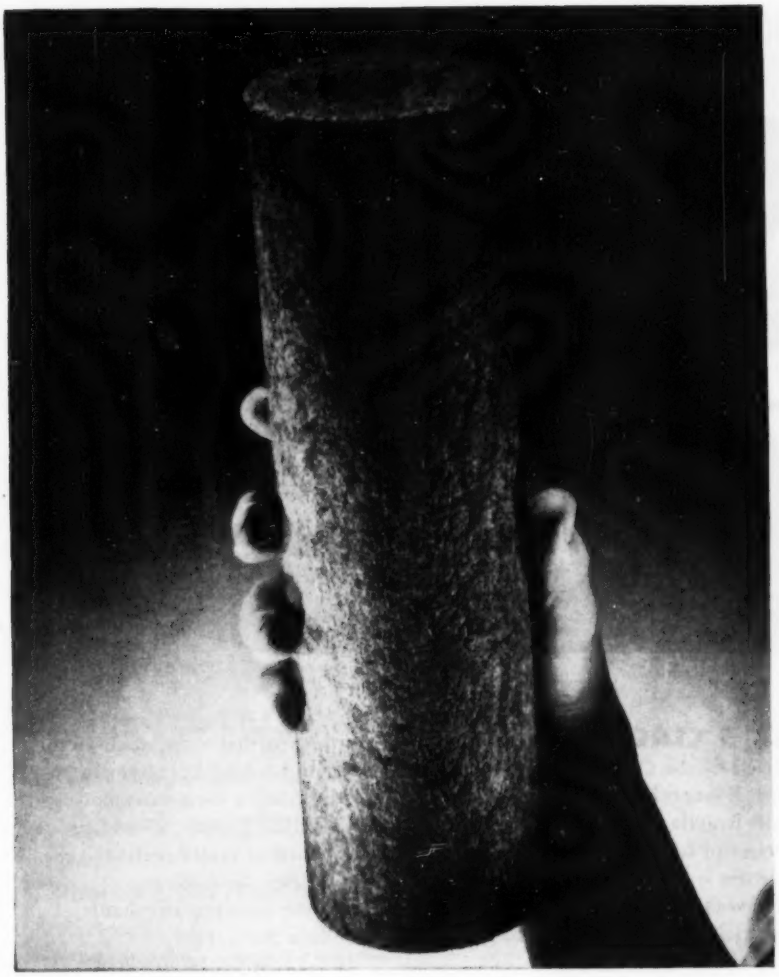
DETROIT DIESEL ENGINE DIVISION

SINGLE ENGINES.. *Up to 275 H.P.* **DETROIT 28, MICHIGAN** MULTIPLE UNITS...*Up to 800 H.P.*

GENERAL MOTORS

GM GENERAL MOTORS DIESEL POWER

DIESEL BRAWN WITHOUT THE BULK



The Simplest Filter Cartridge Lasts the Longest...Twice as Long

Cartridge renewals are cut at least *in half* when Cuno MICRO-KLEAN replaces any other filter. And throughout its service life, MICRO-KLEAN is *guaranteed* for specific performance.

CUNO

Fluid Conditioning

Removes More Sizes of Solids from More Kinds of Fluids

Strain fuels, lubricants, process fluids, etc.—AUTO-KLEAN
Filter fuels, lubricants, process fluids, etc.—MICRO-KLEAN
Clean raw water, recirculating water, etc.—FLO-KLEAN

The Diesel is a Simpler Engine . . . Here's the Simplest Filter

There is nothing complicated about the Cuno MICRO-KLEAN filter, and it fits the requirements of Diesel fuel and lube better than any other filter on the market.

The MICRO-KLEAN is *all filter*—a single, compact structure of "felted" fibres with no internal or external supports to take up space and complicate installation.

The cartridge is mechanically strong due to resinous impregnation and polymerization. It works "mechanically" that is, merely by *obstructing* passage of impurities, rather than by absorption or chemically. It neither removes additives, nor is affected itself by crankcase acids, moisture or other damaging agents. It won't swell or shrink, soften or harden, rupture or channel —or otherwise become distorted to restrict flow or release contaminants to clog injectors or damage parts being lubricated.

Seven Times Longer Life

A railroad, testing competitive makes for its locomotive fuel lines, found MICRO-KLEAN life seven times longer! MICRO-KLEAN gets this greater dirt capacity from its maximum porosity (85-90%) and from its exclusive "graded density in depth", permitting smaller particles to penetrate further, rather than "loading" the surface.

Cuno MICRO-KLEAN, on Diesel fuel or lube, is guaranteed to remove 100% of all solids for which it is rated*, plus a large percentage down to 1 micron.

*10,25,50 microns. Capacities: from a few to over 800 gpm.

CUNO ENGINEERING CORPORATION
Dept. 253C, South Vine Street, Meriden, Conn.

Please send information on Cuno MICRO-KLEAN for Diesel service.

Name.....Title.....

Company.....

Address.....

City.....Zone....State.....

Please attach to business letterhead

Exhaustive ENGINE TESTS Prove

ALL 5 CLRC TESTS, standardized by the Co-ordinating Lubricants Research Committee, prove Shell Rotella Oil superior to the average of leading diesel lubricants . . . from every critical standpoint: parts-wear, corrosion resistance, ring-sticking and piston fouling.

Moreover, further tests, such as the Modified Lauson Lacquer Rating Test and Shell's own extremely severe Four Ball Test . . . all add proof upon proof that Shell Rotella Oil *does* keep engines clean longer . . . *does* extend time between overhauls . . . *does* reduce parts wear.

FLEET SERVICE confirms engine test results!

Read these authorized reports:

Yellow Cab Company, Nashville, Tenn., has 75 cabs, running 24 hours daily. They write: "We have always had trouble with sludge forming in the crankcase of our motors due to the constant start and stop driving . . . On some cabs this sludge completely blocked the passage of oil through the pump screen . . . bearings were burned out.

"After months of operation on Shell Rotella Oil we are glad to report that the *motors (thus far) examined have been found entirely clean, the pump screen as bright as brand new, and we have had no bearing trouble of any nature.*"

Creston Transfer Company, Grand Rapids, Michigan, haul uncrated furniture to the East Coast and southern cities. Creston began using Shell Rotella Oil nearly 4 years ago to correct a serious overhaul problem due to short valve life in their trailer truck engines. Shell Rotella Oil has increased valve life from 8,000 miles to better than 40,000 miles and greatly reduced all-around maintenance costs. Creston Transfer is now expanding with hauls to nearly every state. The proved lower maintenance through using Shell Rotella Oil is a basic part of Creston's expansion planning.

SHELL ROTELLA OIL . . . EXTENDS

You can EXTEND TIME between overhauls...

SHELL ROTELLA OIL slashes maintenance costs—Maintains engine efficiency

1. Positive ANTI-ACID ACTION

Shell Rotella Oil drastically reduces wear in the vital top-cylinder zone by counteracting the acid action of unburned fuel particles. This protection is extremely important in engines with intermittent loading.

2. Constant DISPERSANT ACTION

The excellent dispersant properties of Shell Rotella Oil permit it to dissolve contaminants and hold them in suspension until draining time. This prevents premature fouling.

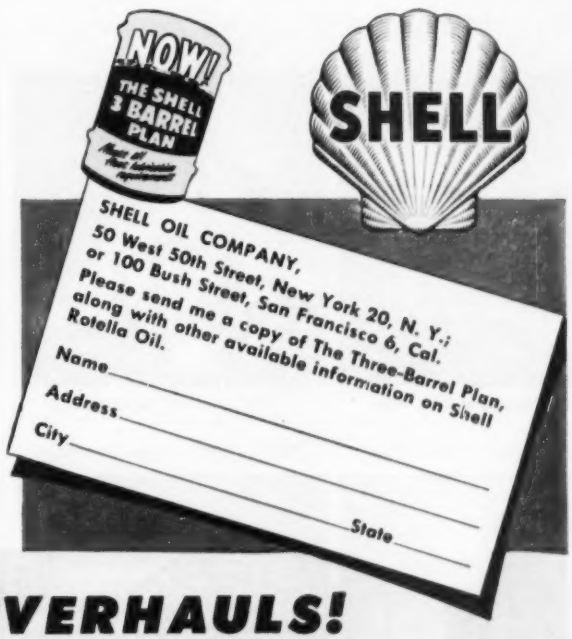
3. Maintained Engine Efficiency

Is the direct result of reduced top-cylinder and ring-face wear. Moreover, new or reconditioned engines operating with Shell Rotella Oil show a welcome extension of the "low oil consumption" period because of this same reduced wear. The above gains, combined with freedom from fouling and a significant increase in valve life, enable you to extend time between engine overhauls.

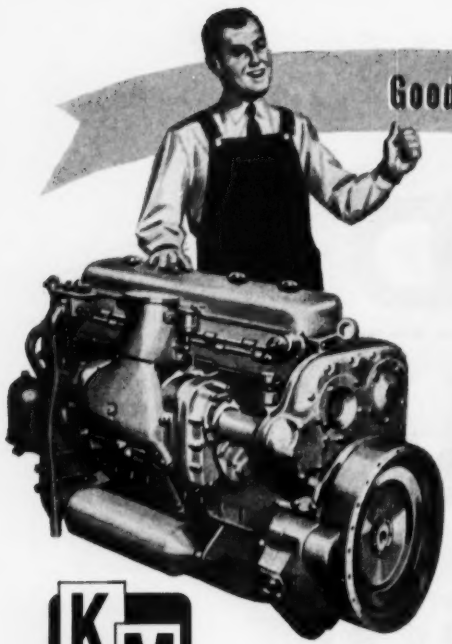
FLEET OPERATORS!

Shell Rotella Oil is "Barrel One" in Shell's famous Three-Barrel Plan for fleet lubrication

If you want to cut lubricant inventories to the bone . . . to realize savings in time, labor and materials . . . mail this coupon for "The Three-Barrel Plan." It's a practical booklet that shows how this revolutionary lubrication program can cut your maintenance costs.


NOW!
THE SHELL 3 BARREL PLAN
SHELL
SHELL OIL COMPANY,
50 West 50th Street, New York 20, N. Y.;
or 100 Bush Street, San Francisco 6, Cal.
Please send me a copy of The Three-Barrel Plan, along with other available information on Shell Rotella Oil.
Name
Address
City
State

TIME BETWEEN OVERHAULS!



Good news for owners of G M DIESEL ENGINES!

You can save time, eliminate parts damage by maintaining your equipment with

KENT-MOORE

SPECIAL SERVICE TOOLS

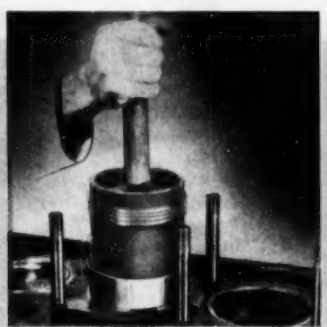
Ease and speed of maintenance have always been important "plus factors" in favor of G.M. Diesel Engines. Take the basic simplicity of their famous 2-cycle design, for example. Note the interchangeability of their low-cost, standardized parts. Then, too, consider the amazing added efficiency with which recommended maintenance operations can be performed... thanks to Kent-Moore Special-Purpose Service Tools.

Yes, once you've used them, you'll agree there's something *extra special* about these Kent-Moore Tools. For you see, they're "service engineered"... developed expressly to meet the essential maintenance requirements of *your* G.M. Diesel Engines. Each tool is designed to perform a specific service or repair operation for which no adequate standard tools exist. And each one is built to accomplish its particular job quickly, easily, accurately . . . without danger of damaging parts, and at lower cost than is possible by means of improvised makeshift methods.

So, whether you maintain your own engines . . . or whether you have them serviced by your G.M. Diesel distributor, you'll do well to insist upon the use of genuine Kent-Moore Special Service Tools.

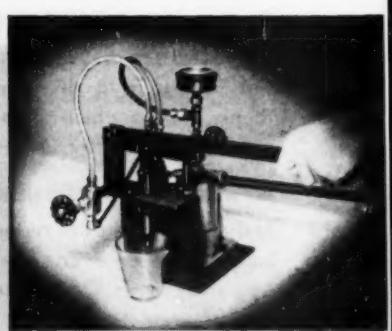
You know the job's done right with Kent-Moore Special Service Tools!

J 1917-A—Tachometer Drive Puller



J 3272-A—Piston Installing Tool

J 1241-A—Injector Service Kit



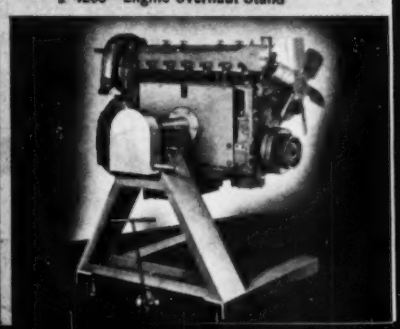
J 2620—Injector Testing Fixture

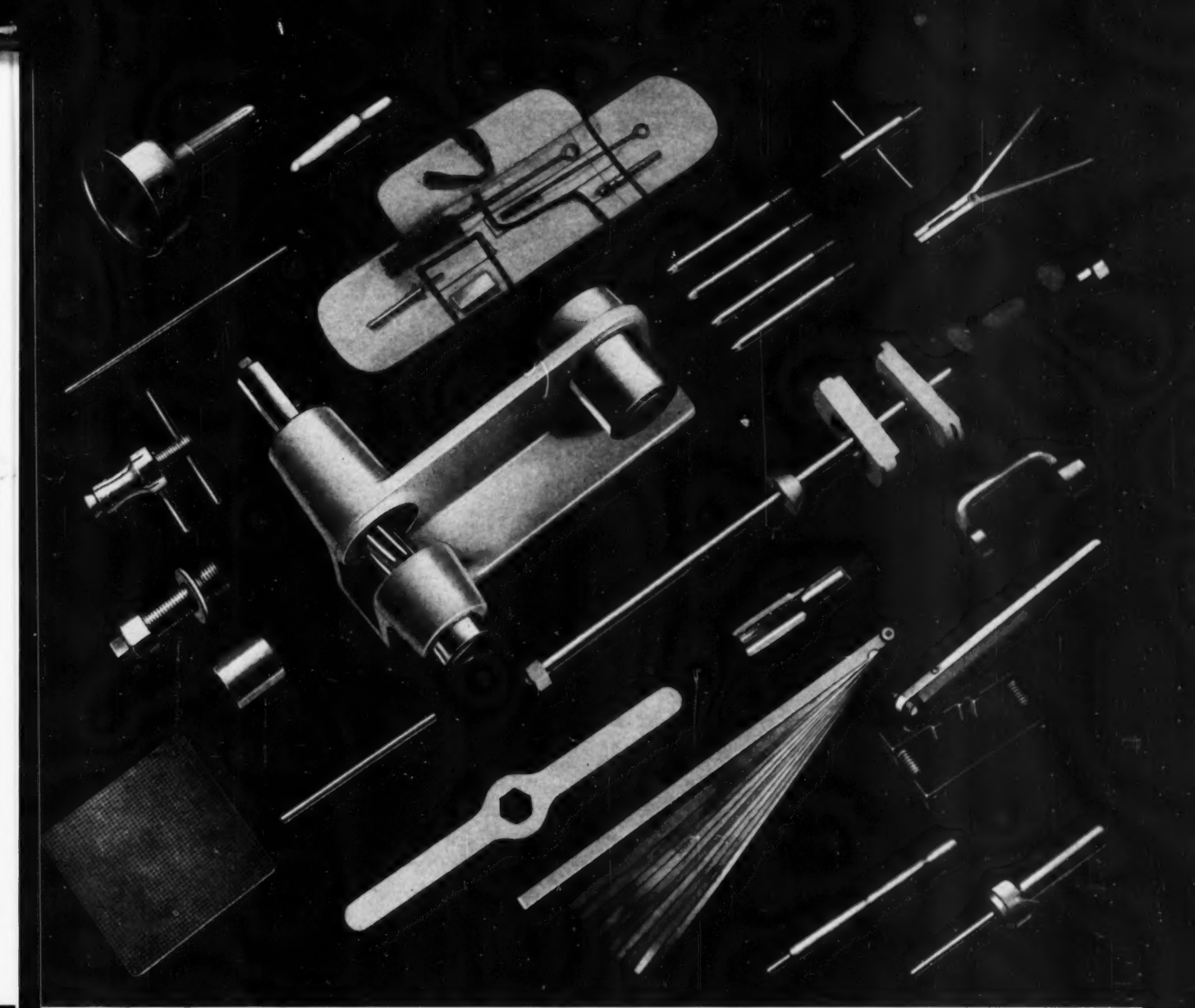
J 1682-B—Blower Oil Seal Installer

J 2202-A—Injector Copper Tube Remover

J 1227—Valve Spring Compressor

J 4265—Engine Overhaul Stand





SPECIAL TOOL REQUIREMENTS FOR BASIC REPAIR SERVICE ON GM DIESEL ENGINES

ENGINE OVERHAUL

TOOL NO.	DESCRIPTION	PRICE
J 1359	Crankshaft Oil Seal Expander	11.95
J 1686	Connecting Rod Bushing Reamer Set	79.50
J 1902-A	Camshaft Gear Puller	13.50
J 1927-A	Flywheel Housing Aligning Studs (4)	3.70
J 1928	Cylinder Head Stud Nut Wrench	5.20
KMO 232	Piston Ring Remover and Replacer	1.50
J 1903	Camshaft and Oil Pump Gear Replacer	4.95
J 1904-A	Flywheel Loosening Jack Screws	2.50
J 1909	Cylinder Liner Clamps (Set of 3)	4.75
J 1918	Cylinder Liner Remover	19.95
J 3272-A	Piston Inserter	11.95
J 3174-A	Feeler Gauge Set (For piston fitting)	2.75
J 1917-A	Tachometer Drive Puller	11.50

ENGINE TUNE-UP

TOOL NO.	DESCRIPTION	PRICE
J 1242	Injector Timing Gauge (Std. Output 1.484")	.95
J 1853	Injector Timing Gauge (High Output 1.460")	.95
J 1319-A	Cylinder Compression Gauge	38.50
J 1652-A	Governor Spring Retainer Nut Wrench	2.25
KMO 233	Valve Lash Feeler Gauge (.008"-.010")	.45
KMO 233-B	Valve Lash Feeler Gauge (.011" and .013")	.45
KMO 320	Fuel Pressure Gauge	4.95

CYLINDER HEAD OVERHAUL

TOOL NO.	DESCRIPTION	PRICE
J 2202-A	Injector Copper Tube Installer Set	15.95
J 267	Valve Guide Remover 11/32" Guide	1.85
J 4144	Valve Guide Replacer	2.90
J 3091	Valve Seat Insert Remover	15.95
J 1736	Valve Seat Insert Replacer	4.85
J 3087	Cylinder Head Holding Plates (Pair)	18.65

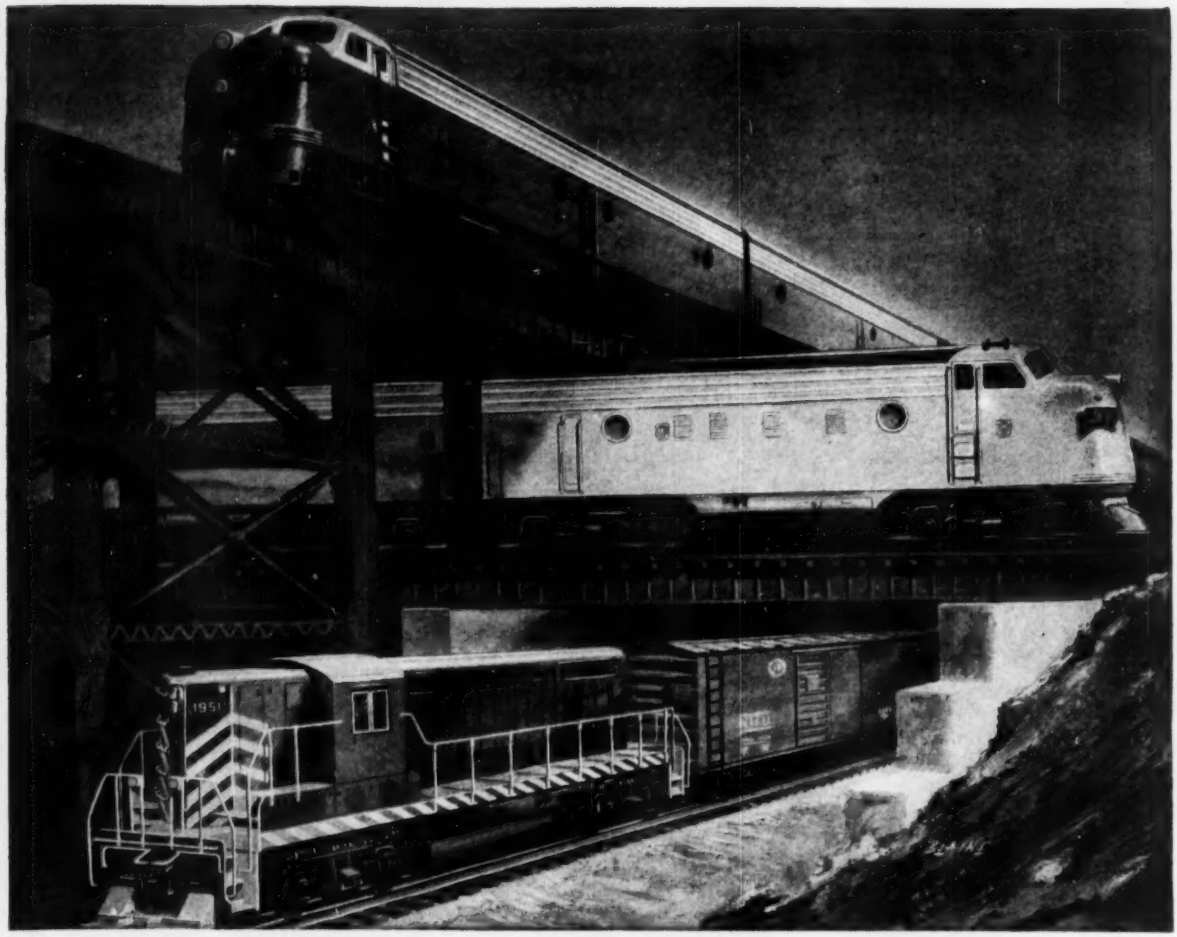
TERMS: *C.O.D. orders shipped net, F.O.B. Detroit. 5% discount allowed cash with order. All prices subject to change without notice, and all orders subject to confirmation by Kent-Moore Organization, Inc.*

KENT-MOORE ORGANIZATION, INC.

Engineers and Manufacturers of Special Automotive Service Tools and Equipment

5-105 GENERAL MOTORS BUILDING • DETROIT 2, MICHIGAN

YOURS FOR THE ASKING! 24-Page Special Service Tool Guide for owners of G.M. Diesel Engines. Write Dept. D. for your free copy today!



BACKBONE OF TRANSPORTATION

ONE thing that makes American railroads the most efficient in the world is their fleet of 10,000 General Motors Diesel locomotive units now in service.

Although Diesels number less than 20% of the nation's freight locomotives, they are handling today almost half of the total freight ton-miles—helping railroads move freight faster, more efficiently than ever before.

A typical Diesel freight locomotive hauls 3,000 tons 20 miles in an hour, while the average steam locomotive pulls only 2,400 tons 15 miles in an hour. Diesels carry bigger loads and carry them faster!

And because Diesels require far less time out for servicing and maintenance, they work three times as many hours per year! This helps explain why U. S. railroads were able to do 30% more work in 1950 than in 1940—*with 18% fewer locomotives.*

That is why demand for this modern motive power is so urgent. Faced with the biggest traffic load in all history, railroads are calling for more and more General Motors Diesel locomotives. Despite restrictions and material shortages, Electro-Motive is doing its utmost to meet the nation's needs.

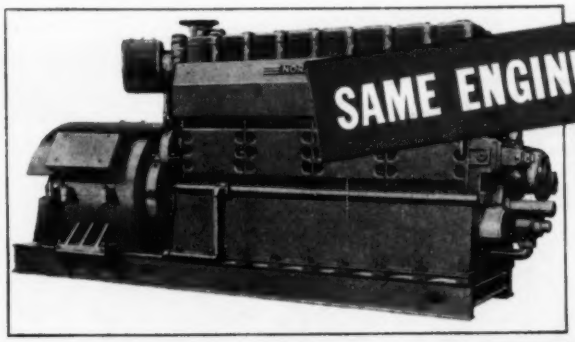
GM
GENERAL MOTORS
LOCOMOTIVES

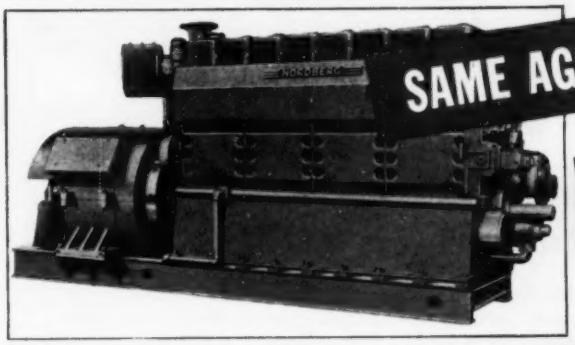
ELECTRO-MOTIVE DIVISION

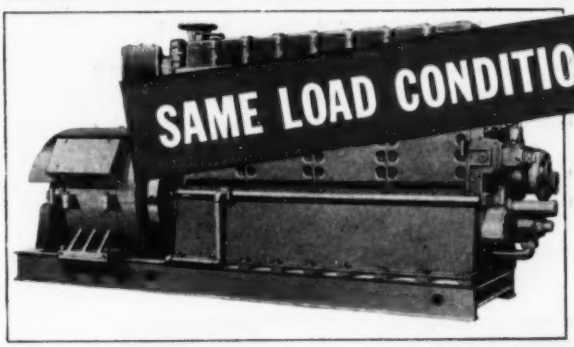
GENERAL MOTORS • LA GRANGE, ILL.

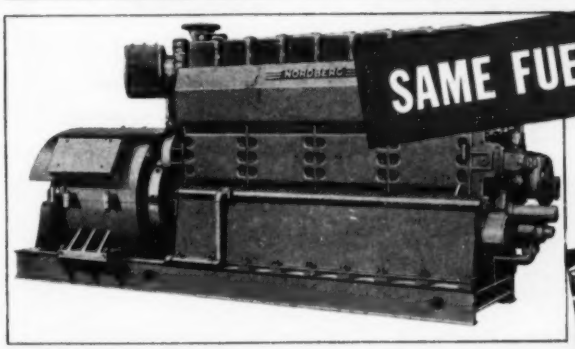
Home of the Diesel Locomotive

In Canada: GENERAL MOTORS DIESEL, LTD., LONDON, ONT.









Yet Lubrication is Different!

Yes, it's not unusual. From the first day in service, every engine begins to develop its own lubricant "diet." Frequently it's a matter of care and attention given by the operator. Often it's caused by geographic or climatic differences. Certainly, no two engines ever built performed identically . . . wore out at the same time . . . or required the same amount and kind of lubricant for best performance.

For these reasons *your* Diesel engine investment should be protected with regular lubrication engineering service. A Cities Service representative is highly skilled, highly trained and thoroughly familiar with the lubrication requirements of every type of Diesel equipment. Moreover, behind him stands an alert, completely integrated oil company with a full line of top quality industrial lubricants. Contact the office nearest you or write below for further information.

A Complete Line of Top Quality Petroleum Products Including:

- **New Heavy Duty Diesel Oils**
- **New Low RPM Diesel Oils**
- **Exclusive Diesel Engine Oils**
- **Exhaust Analyzer Service**

FREE! THIS HELPFUL BOOKLET

CITIES SERVICE OIL COMPANY
Sixty Wall Tower, Room 148
New York 5, N. Y.

Please send me without obligation your new booklet entitled "Diesel Engine Lubrication."

Name _____

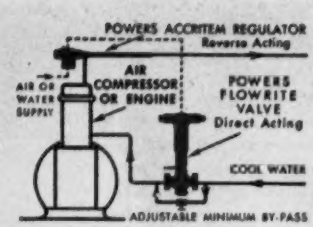
Company _____

Address _____

City _____ *State* _____

CITIES SERVICE

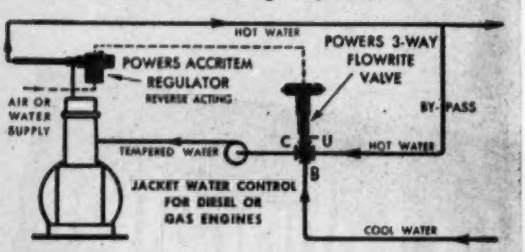
QUALITY PETROLEUM PRODUCTS



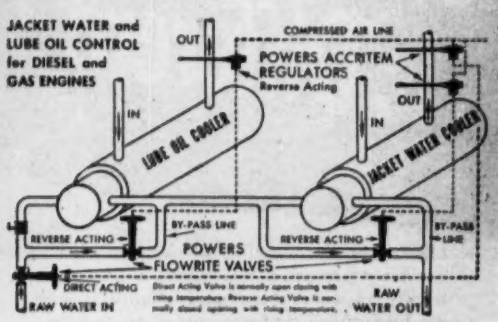
POWERS

ACCRITEM REGULATOR

Unsurpassed for reliability and power to operate large or small size 3-way or 2-way diaphragm valves for accurate control of jacket water and lube oil cooling temperatures.



Only a few of many applications are shown here.



Gives

Accurate, Low Cost Heat Control

Use Accritem Regulators to control diaphragm operated valves or dampers. They save labor, stop losses caused by over-heating and have the following—

IMPORTANT ADVANTAGES

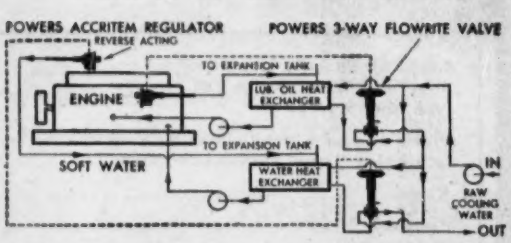
- ***Adjustable Sensitivity*** and over-heat protection.
- ***Calibrated Dial*** temperature adjustment.
- ***Simple, Rugged Construction*** withstands vibration and insures many years of reliable service.
- ***Temperature Ranges*** 50 to 250° F. and 150 to 350° F.
- ***Easy to Install*** Requires 15 lb. supply of compressed air or water for its operation.
- ***Small Size***—regulator head is only 2⅞" x 3⅝", sensitive bulb is 12" long with ½" I.P.S. connection.

Proper Cooling Temperatures assured by Powers Accritem Regulators

* Makes ignition easier * Prevents rapid breakdown of lube oil * Decreases cylinder and piston ring wear * Reduces danger of piston slezure * Lowers fuel and lube oil consumption

POWERS

FLOWRITE and METAFLOW Diaphragm Valves controlled by a POWERS ACCRITEM HEAT REGULATOR provide an unbeatable combination for *better control and lower maintenance*



Write for Bulletin 316—or phone our nearest office for prices and further information about POWERS ACCRITEM regulators and diaphragm valves.

THE POWERS REGULATOR CO.

SKOKIE, ILL. • OFFICES IN OVER 50 CITIES • See Your Phone Book

CHICAGO 13, ILL., 3819 N. Ashland Ave. • NEW YORK 17, N.Y., 231 E. 46th St.
LOS ANGELES 5, CAL., 1808 West 8th St. • TORONTO, ONT., 195 Spadina Ave.
MEXICO, D. F., Apartado 63 Bis.

AMD

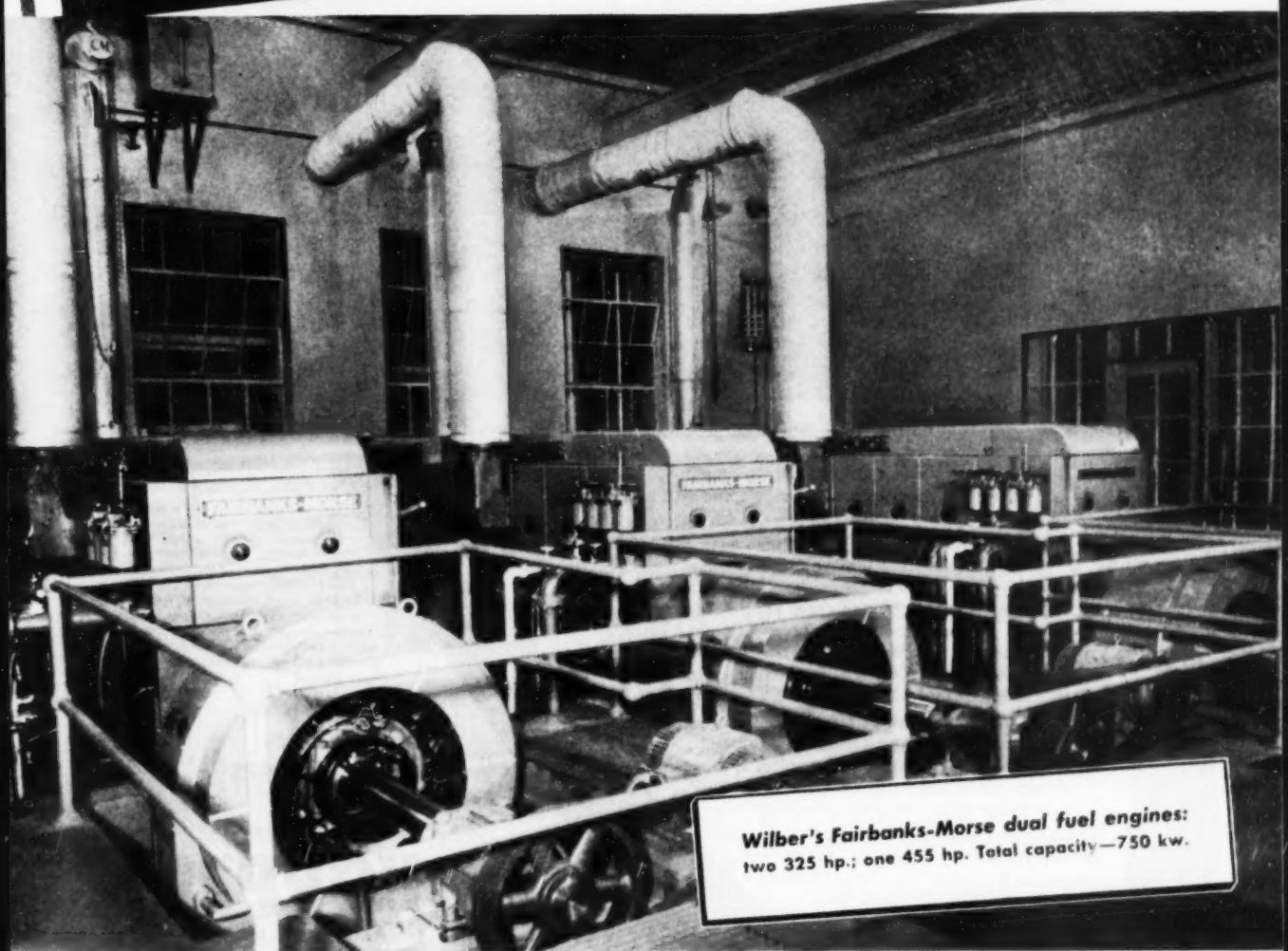
60 Years of Temperature and Humidity Control

Wilber's Saving $8000 Yearly with FAIRBANKS-MORSE Dual Fuel Power!

The 1455 people of Wilber, Nebraska, are enjoying a total savings of over $8000.00 a year, since the town started producing its own power in the first 100% dual fuel power plant in the state.

Burning economical natural gas, two Fairbanks-Morse Model 31 dual fuel engines give the Wilber plant ample capacity with plenty of standby power for emergency.

Wilber is one of many dual fuel plants—Fairbanks-Morse equipped—that mark a new avenue towards lower power costs for your community or your business. Fairbanks, Morse & Co., Chicago 5, Ill.



Wilber's Fairbanks-Morse dual fuel engines: two 325 hp.; one 455 hp. Total capacity—750 kw.

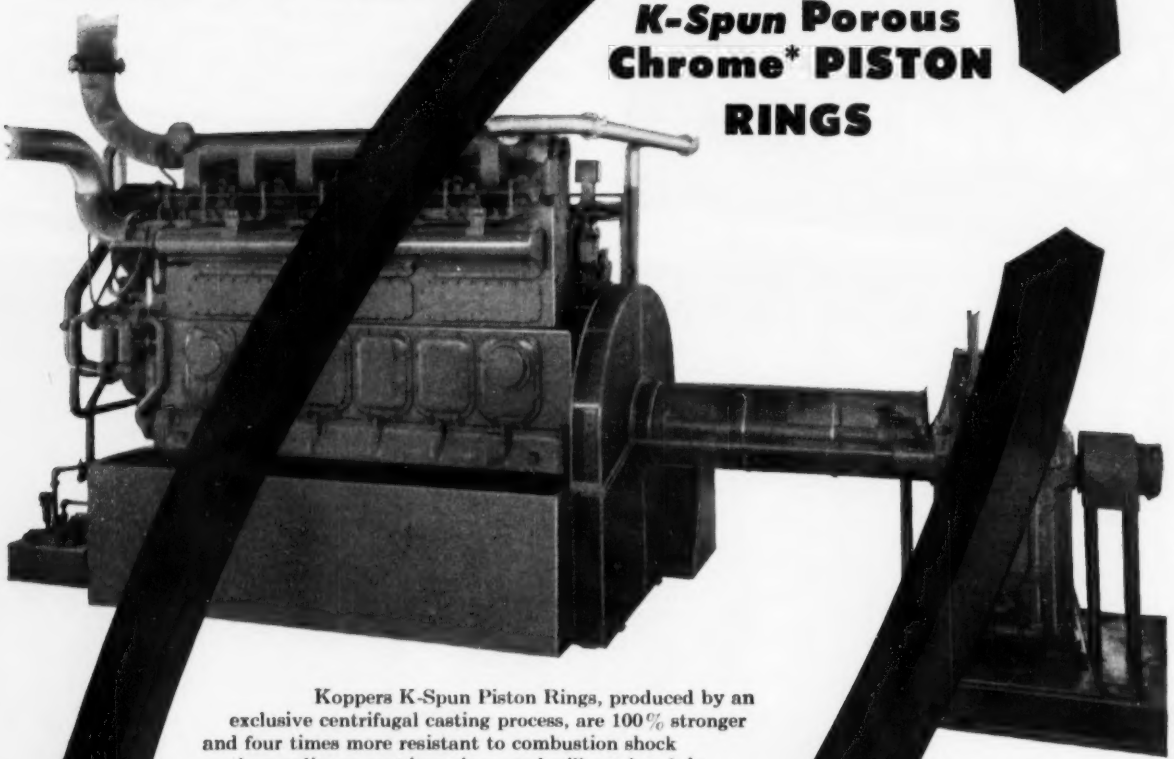
FAIRBANKS-MORSE,

a name worth remembering

DIESEL AND DUAL FUEL ENGINES • DIESEL LOCOMOTIVES • ELECTRICAL MACHINERY
PUMPS • SCALES • RAIL CARS • MAGNETOS • FARM MACHINERY

UNION OIL COMPANY cuts cylinder wear, lengthens service of equipment with...

...KOPPERS *K-Spun* Porous Chrome* PISTON RINGS



Koppers K-Spun Piston Rings, produced by an exclusive centrifugal casting process, are 100% stronger and four times more resistant to combustion shock than ordinary cast iron rings, and will not break in installation or in service.

Koppers Porous Chrome Rings have a porous chrome surface that holds and distributes oil during break-in, quickly wears down to perfectly seated solid chrome that prevents grit and other particles from embedding in the ring surface where they can scratch cylinder walls. Porous Chrome Rings last up to four times as long as other rings, reduce cylinder wear 50% or more.

That's why hundreds of companies like Union Oil are reporting amazing savings in equipment and maintenance costs through the use of Koppers Rings. Remember . . . we make rings for *anything* that uses piston rings.

If you have a piston ring problem, why not get the *right* answer from us? Write, wire or phone KOPPERS CO., INC., *Piston Ring Dept.*, 1640 Hamburg St., Baltimore 3, Maryland.

Union Oil Company's newly modernized Avila (California) Terminal utilizes three 460 h.p. Enterprise dual-fuel engines with single-stage Ingersoll-Rand SHV centrifugal pumps. Engines are 6 cylinder, 12" bore, 15" stroke, 4 cycle, 450 rpm, non-supercharged. Each piston is fitted with two Porous Chrome, three tapered and two oilcutter Koppers Piston Rings.

KOPPERS

KOPPERS

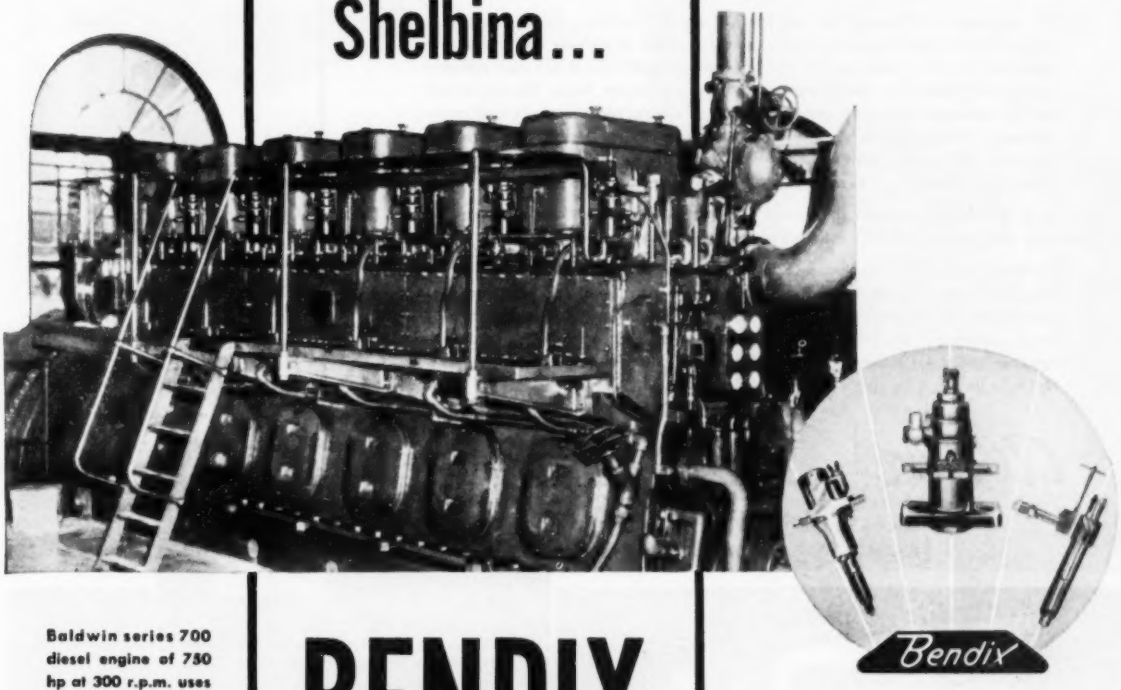
AMERICAN HAMMERED

PISTON RINGS

*VAN DER HORST PROCESS

ONLY KOPPERS CAN FURNISH K-SPUN OR POROUS CHROME!

When They *Step up* Service in Shelbina...



Baldwin series 700 diesel engine of 750 hp at 300 r.p.m. uses Bendix Fuel Injection equipment.

BENDIX
FUEL INJECTION and BALDWIN DIESEL ENGINES

Step in!

Municipal electric power has a 56 year history in Shelbina, Mo., a town of 2000 inhabitants, located about 100 miles northwest of St. Louis.

Diesel powered since 1932, the equipment used in Shelbina power plant has been progressively modernized to meet ever increasing capacity requirements. The latest addition is a Baldwin diesel series 700 with Bendix Fuel Pumps and Injection Equipment.

In the great advance that diesel power is making, Bendix fuel injection equipment, together with outstanding diesel engine manufacturers, is playing an increasingly important part.

SCINTILLA MAGNETO DIVISION of
SIDNEY, NEW YORK

Bendix
AVIATION CORPORATION

Export Sales: Bendix International Division,
72 Fifth Ave., New York 11, N.Y.
Western Market Office: 582 Market Street, San Francisco 4, Calif.

NEW

continuous protection for your diesel engine

The new Alnor Pyrotac brings you the constant protection you've been wanting for your Diesel engine—an instant check of all cylinder temperatures, *at a glance.*

This precision-built instrument continuously monitors exhaust temperatures . . . automatically checks each cylinder every minute. Watching the pyrometer scale from as far away as 20 feet, you can instantly tell if any one cylinder is out of balance . . . allows supervision by a minimum force. The instrument can be wired to an alarm circuit to warn of excess temperatures and automatically shut down the engine when maximum safe temperatures are exceeded. The pointer on the selector switch will stop at the number of the offending cylinder . . . exactly locating the source of trouble.

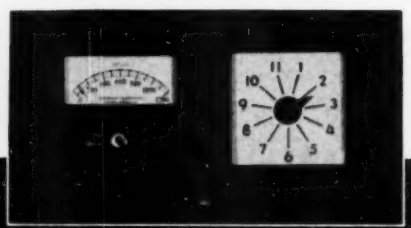
Such automatic, constant protection reduces maintenance time and expense to a minimum—increases efficiency and operating economy.

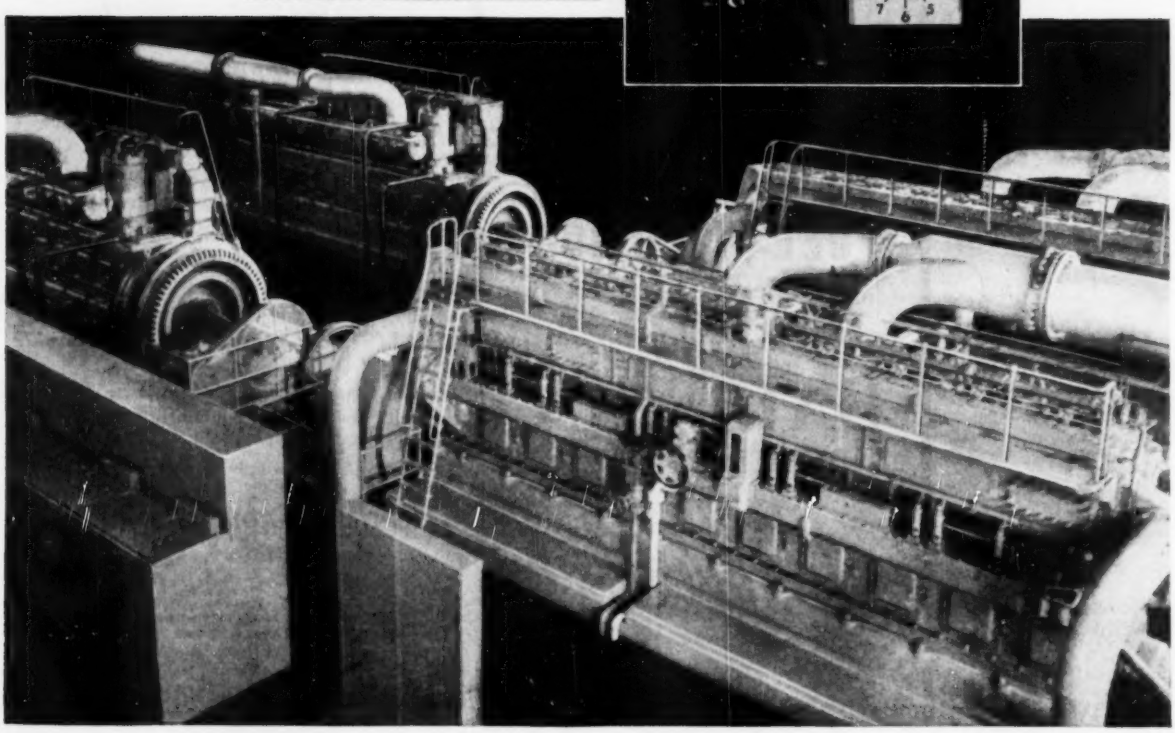
The Pyrotac presents many opportunities for improved instrumentation in the Diesel and gas engine field. It can be used to warn of excess temperatures in cylinders, entire engines, overheated bearings, burn-out danger in fields of large generators, etc. Why not ask for Alnor assistance in solving your pyrometer problems today? Illinois Testing Laboratories, Inc., Room 507, 420 N. La Salle St., Chicago 10, Ill.

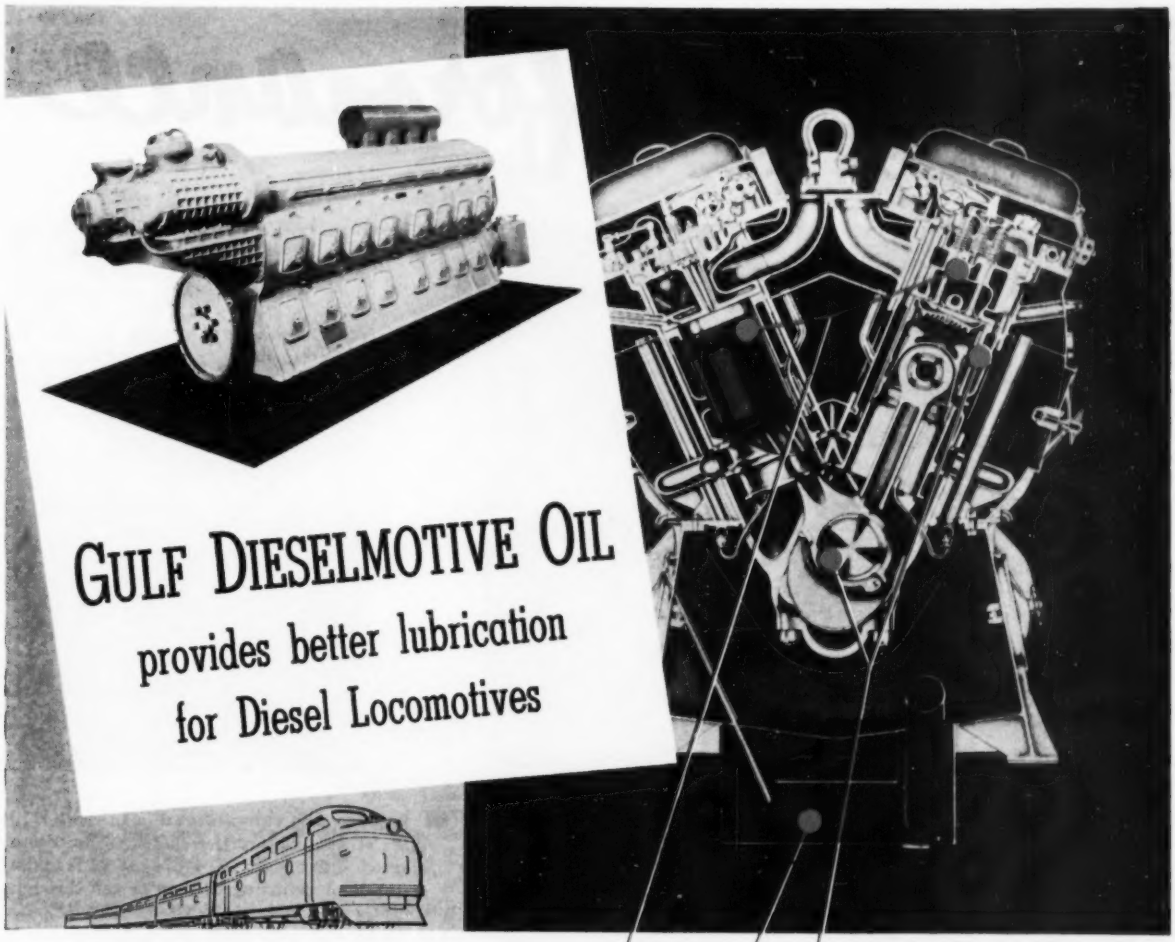
THE ALNOR PYROTAC
available in several multi-circuit models.

Alnor

PRECISION INSTRUMENTS FOR EVERY INDUSTRY







GULF DIESELMOTIVE OIL

provides better lubrication for Diesel Locomotives

Cutaway view showing typical cylinders, pistons and valves in a two-cycle, 1500 hp railroad Diesel engine with Unaflow scavenging.

effective detergency **-keeps engines cleaner**

lasts longer **-extends oil change period**

provides better protection **-insures less wear, lower maintenance costs**

GULF Dieselmotive oil provides the kind of lubrication that means higher availability and lower maintenance costs for railroad Diesel locomotives.

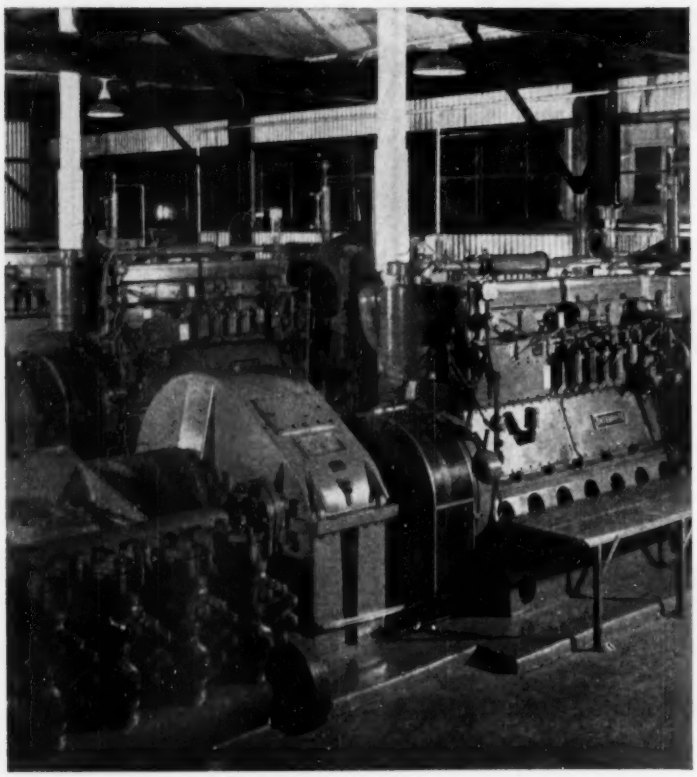
The effective detergent action of this quality lubricating oil prevents deposit of sludge- and varnish-forming materials — keeps piston rings and valve stems free, helps you avoid cylinder head changes and other maintenance measures.

Gulf Dieselmotive Oil has outstanding resistance to oxidation and sludging which means longer, useful life. Thus you make a saving in lubricant costs. And it is noncorrosive to silver and alloy bearings.

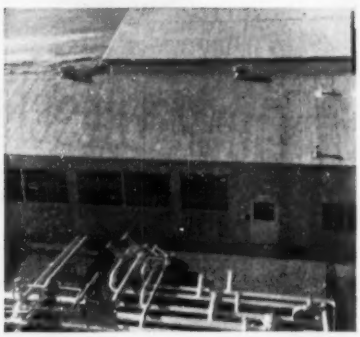
Diesel locomotives in both main line and switching service are setting maintenance records with Gulf Dieselmotive Oil that are hard to beat. To get the advantage of this outstanding Diesel lubricating oil in your engines, call in a Gulf Lubrication Engineer today. Write, wire, or phone your nearest Gulf office. Gulf Oil Corporation · Gulf Refining Company, Gulf Building, Pittsburgh, Pennsylvania.

FIFTY YEARS OF SERVICE
1901 GULF 1951
PETROLEUM AND ITS PRODUCTS

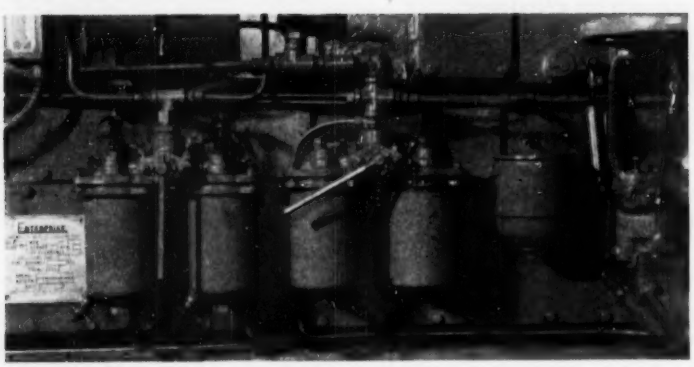
HOT Performance



Hot or cold, Purolator Oil Filters do the job they're designed for. Here at Antelope Station, Union Oil Company of California's new pumping plant, 3 Enterprise Diesel engines push upwards of 1000 barrels 16 gravity crude per hour uphill toward Avila, Cal., 60 miles west. And they do it "hot."



Engines are conventional 8 in. bore x 10 in. stroke Enterprise Diesels of medium speed (220 h.p. at 720 RPM). Fuel is taken from line, centrifuged, then passed through heater to raise temperature to 180° F.



Hot, free-flowing fuel goes through metalized Purolator strainers on fuel pump which passes it on through tandem Purolator Filters to remove further impurities. Result: smoke-free exhaust—efficient performance at 2500-hour mark.

Antelope installation is another case illustrating the reliance manufacturers and operators place on the Purolator equipment.

A Purolator Micronic* Oil Filter, for example, traps abrasive particles as small as microns (.000039"); *traps more dirt faster*—because its accordion-pleated refill provides filtering area up to 10 times greater than old-style filters. And it won't warp, distort, or disintegrate.

For lube oil, a Purolator* assures less wear on hard-working bearings and other vital parts.

For fuel, it provides the complete filtration, so essential for close tolerance injector orifices.

Whatever your filtering problem, let our engineering staff show you how to solve it!

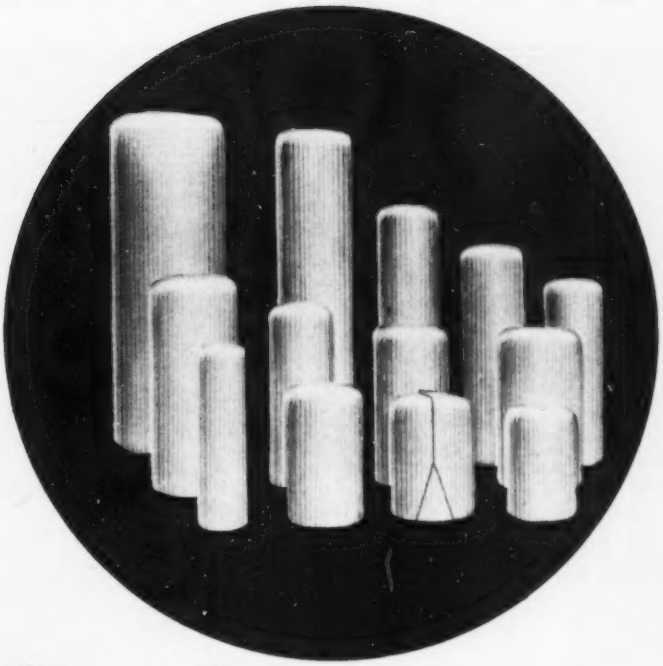
* Reg. U. S. Pat. Off.

Protect your Power with...

PUROLATOR MICRONIC OIL FILTER

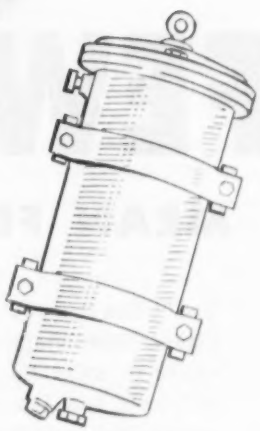
"FIRST IN THE FIELD OF FILTERING"

PUROLATOR PRODUCTS, INC.
Rahway, New Jersey, and Toronto, Ontario, Canada
Factory branch offices: Chicago, Detroit, Los Angeles



there's a WINSLOW ELEMENT for any FILTER*

More and more, as the national emergency makes it imperative that you protect your engines against the danger of being unable to replace or repair them, your maintenance program must provide for dependable filtration of fuels and lubricants. The urgency of your need makes it doubly worth your while to remember that Winslow manufactures over 200 sizes and shapes of fine elements. There's a Winslow Element for any make or model of filter that you may own!



WRITE FOR YOUR COPY OF OUR POPULAR BOOKLET, "THE CASE OF THE DIRTY DRIP." *IT'S FREE!*

WINSLOW FILTERS

*there's a WINSLOW FILTER for any ENGINE

W-512 **Winslow Engineering Company** 4069 Hollis Street • Oakland 8, California

P&H DIESEL ENGINES

2-CYCLE

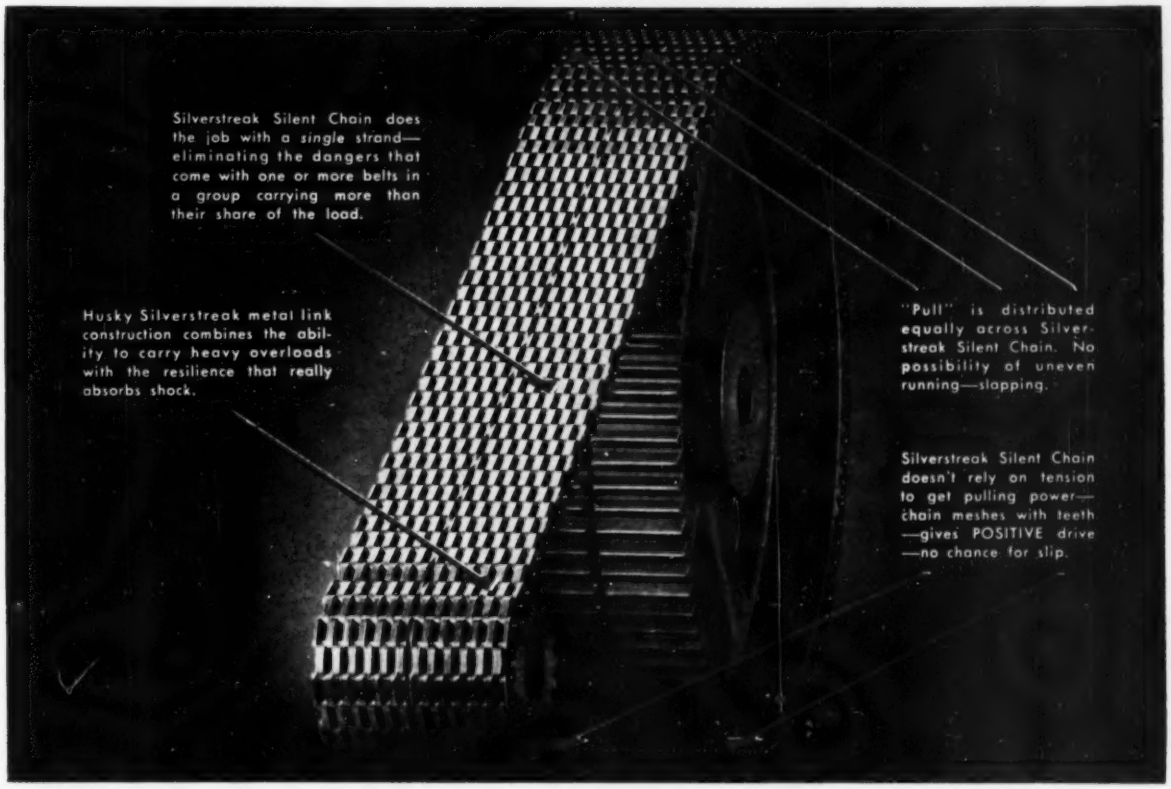
FEWER PARTS

MEAN FEWER TROUBLES FOR YOU

You'll like the way so many parts have been designed *out* of P&H Diesels. It makes them simpler, more dependable for all types of service. It makes them easier to understand, easier to service. It lets you cut parts inventory — and costs, too! It's another important reason why experienced users are switching to P&H Diesels . . . *standardizing on them.* Five models: 1, 2, 3, 4, and 6-cyl. For literature, write P&H Diesel Division, Harnischfeger Corporation, Port Washington, Wisconsin.

P&H DIESEL DIVISION
HARNISCHFEGER CORPORATION
PORT WASHINGTON WISCONSIN, U. S. A.

Get full rpm transmission...


Silverstreak Silent Chain does the job with a *single* strand—eliminating the dangers that come with one or more belts in a group carrying more than their share of the load.
Husky Silverstreak metal link construction combines the ability to carry heavy overloads with the resilience that really absorbs shock.
"Pull" is distributed equally across Silverstreak Silent Chain. No possibility of uneven running—slapping.
Silverstreak Silent Chain doesn't rely on tension to get pulling power—chain meshes with teeth—gives POSITIVE drive—no chance for slip.

LINK-BELT Silverstreak Silent Chain Drives

Slip-proof Slap-proof Shock-proof

TAKE the proven road to increased production — through the best in high-speed power transmission. You'll find Link-Belt Silverstreak Silent Chain Drives are 98.2% efficient. With normal maintenance, you have a *positive* drive that runs for years and years.

And note this important point — on extremely short centers Silverstreaks lose none of their efficiency. What's more, reduction ratios as high as 10-to-1 are frequently used. Both of these Silverstreak features save you valuable space.

One test will prove to you why thousands of production-minded engineers have standardized on Link-Belt Silverstreak Silent Chain Drives.

LINK-BELT

12,200

SILVERSTREAK SILENT CHAIN DRIVES

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in principal cities.

SAFE — FOR YOUR ENGINES AND COMPRESSORS

SAFETY SEAL

Pressure-Balanced Piston Rings

No other piston ring protects your cylinder liners against scoring and excess wear like the new SAFETY SEAL Ring. It is the safest sealing ring ever designed, because it is the ONLY ring that gives you Pressure-Balanced Circularity. This means that correct and uniform ring-to-cylinder wall pressure is maintained at every point around the diameter of the ring.

With Safety Seal Rings your engine or compressor is safe from the excessive and uneven cylinder wear which often occurs with older type sealing rings not designed for pressure balance. In addition, you get all of the other important benefits of an improved single-piece sealing ring . . . higher compression, increased horsepower, and low fuel and lube oil consumption . . . which result from a positive, leak-proof piston seal.

If you have heavy load demands on your engines or compressors, the chances are good that you can increase output and cut operating costs with Safety Seal Rings. No cost or obligation for help from our experienced Engineering Department with your piston ring problems. Write today for the name of your nearest Safety Seal representative.

THE SAFEST SEALING RING EVER DESIGNED

The new Safety Seal Ring is the safest and most efficient ring I have ever designed during 33 years of piston ring experience. It is an *improved* single-piece sealing ring designed specifically for today's modern equipment and heavy work loads and made only by Safety Seal Piston Ring Co. (not affiliated with any other piston ring manufacturer). Safety Seal Rings are *service-proved* and guaranteed to perform to your satisfaction.

WM. S. BAKER,
Chief Engineer

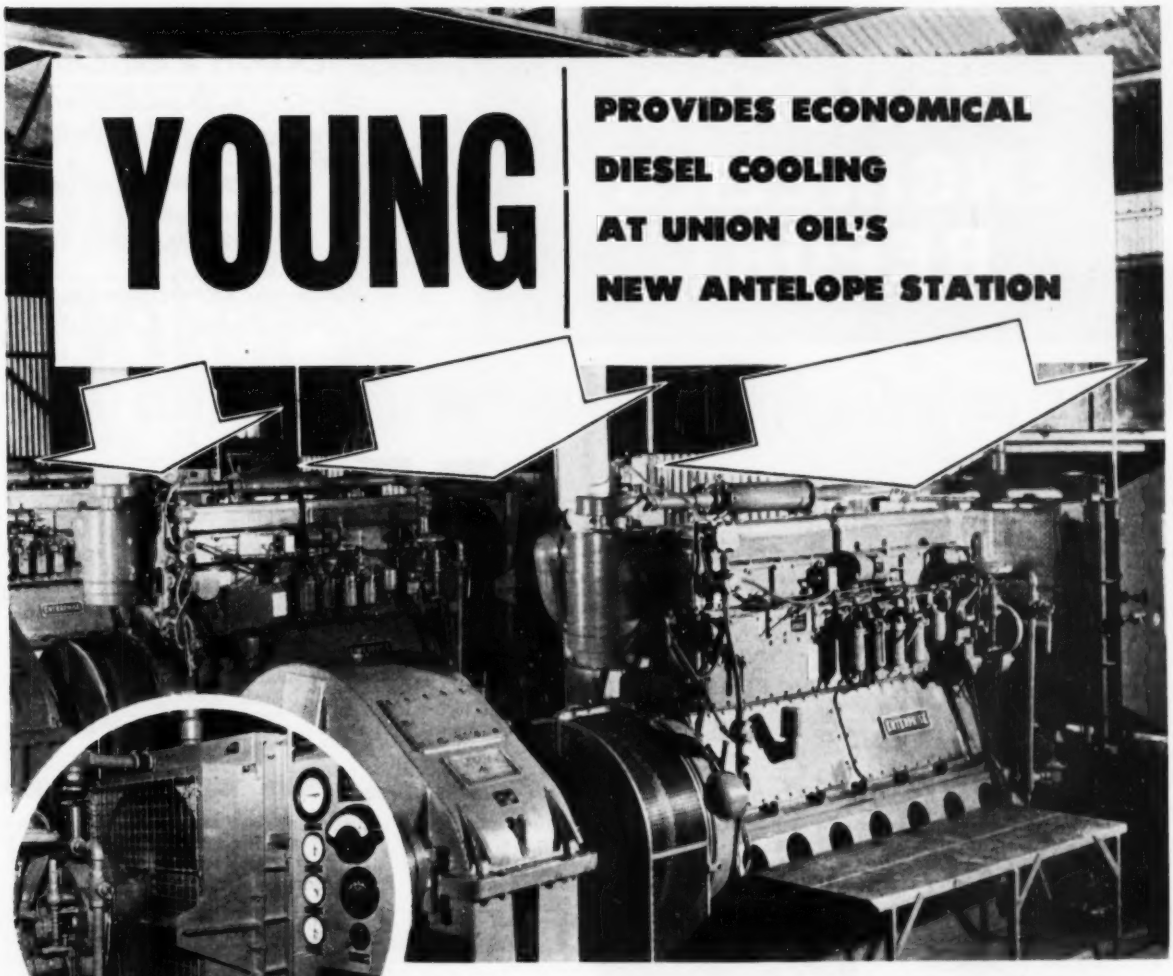
All Types of Plain and Oil Rings

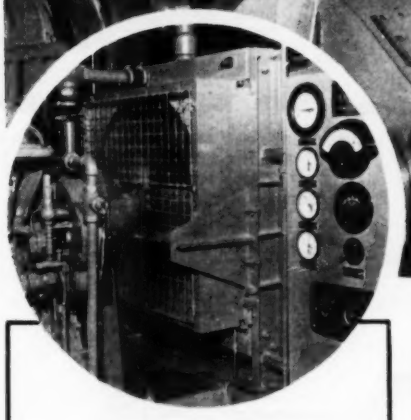
SAFETY SEAL PISTON RING CO.

P. O. Box 106 Phone FOrtune 2838 Fort Worth 1, Texas

YOUNG

PROVIDES ECONOMICAL DIESEL COOLING AT UNION OIL'S NEW ANTELOPE STATION





8 REASONS WHY YOUNG "MONO-WELD" RADIATORS GIVE TROUBLE-FREE SERVICE

1. Fabricated steel top and bottom provide rugged, solid support base for core.
2. Steel channel side members assure rigidity necessary for mobile use.
3. Cores of chosen specification for the particular services are designed, reinforced and built to meet rugged industrial service.
4. Tank structures adaptable to requirements of capacity, size and location of water connections.
5. Cast aluminum air foil or reinforced stamped steel blade type fans available. Offer highest air delivery with lowest power consumption.
6. Fan shrouding specially designed to provide maximum air flow to all areas of the core.
7. Heavy-duty, over-size fan bearing assembly designed by Young to handle all radial and thrust loads.
8. Rigid fan shaft bearing and motor support securely fastened to radiator frame with formed steel reinforced members.

Increased operating economy and self-sufficiency have been attained at the new Antelope Booster Station of the Union Oil Company. Young "Mono-Weld"* Radiators fit into the picture perfectly. They provide thrifty jacket water cooling for the three Enterprise Diesels installed. Also, the maintenance problem is minimized by the rugged welded steel construction of the Young units (see features at left) capable of withstanding the stresses of mobile equipment application. Your nearest Young Representative will gladly point out the advantages of "Mono-Weld"* Radiators for your applications.

* Trade Mark

We will be pleased to send you a copy of Young Catalog No. 1651, giving the design and construction details of one-piece and sectional type "Mono-Weld"* Radiators.

YOUNG

Heat Transfer Products for Automotive and Industrial Applications.

Young Quality — T. M. Reg. U.S. Pat. Off.

Heating, Cooling, Air Conditioning Products for Home and Industry.

YOUNG RADIATOR COMPANY

Dept. 411-K • RACINE, WISCONSIN

Factories at Racine, Wisconsin and Mattoon, Illinois

STANDARD ENGINEER'S REPORT

DATA

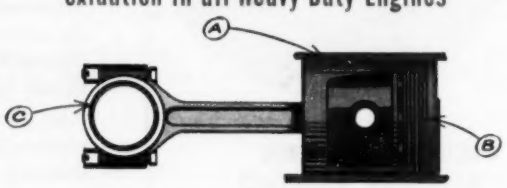
LUBRICANT	RPM Delo Oils
UNIT	#450 International gasoline engines
CONDITIONS	Heavy hauling
PERIOD	1½ years
FIRM	Kenneth Poorman Co., Portland, Oregon.

Rings "perfect", only 0.001 cylinder wear after 80,000 miles!

RPM DELO OILS eliminated all stuck rings, scoring and deposit trouble in 21 units like these, hauling loads up to 72,000 pounds on construction jobs. 80,000 miles after switching to RPM DELO Oils a check showed: "Rings so perfect they could have been put back in the engine. Average cylinder wear only 0.001 inch," according to Maintenance Supt. C. H. Johnson, Kenneth Poorman Co., Portland, Ore.

"100,000 MILES IS NOW OUR OVERHAUL PERIOD, but the way RPM DELO Oils perform, I believe we could extend it to 200,000 miles," says Mr. Johnson (left), shown here with Manager Joe Stephani. RPM DELO Oils have made many outstanding service records in all types of heavy-duty gasoline and diesel engines. They will keep your engines clean, reduce wear and cut operating costs. One of these will meet the operating conditions in your heavy-duty engine: RPM DELO Heavy Duty, RPM DELO Special, RPM DELO Supercharged-1 Oil, RPM DELO Supercharged-2 Oil.

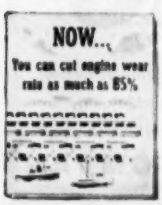
How RPM DELO Oils reduce wear, corrosion, oxidation in all Heavy-Duty Engines



A. Contain special additives that provide metal-adhesion qualities...protect parts whether hot or cold, running or idle.

B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean...helps prevent piston scuffing.

C. Special compounds stop corrosion of any bearing metal and foaming in crankcase.



FREE BOOKLET on the RPM DELO Oils gives you complete information. Write or ask for it today.

RPM DELO LUBRICATING OILS

TRADEMARK "RPM DELO" REG. U.S. PAT. OFF.

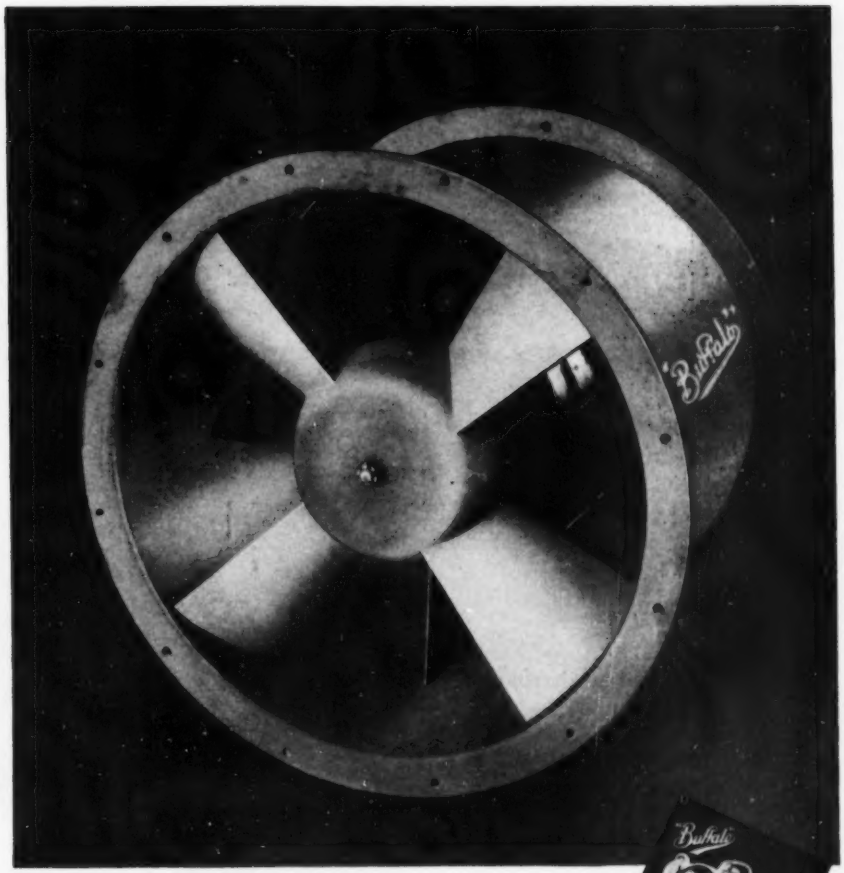
FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street • San Francisco 20, California

THE CALIFORNIA COMPANY
P. O. Box 780 • Denver 1, Colorado

STANDARD OIL COMPANY OF TEXAS
P. O. Box 862 • El Paso, Texas

THIS DIESEL COOLER is a *Space Saver!*



"Buffalo" AXIAL FLOW FAN

Diesel cooling fans, particularly those for mobile Diesels, must be compact. At the same time, they must be capable of comparatively high velocity delivery for efficient cooling. Such are the characteristics of "Buffalo" Type "B" Vaneaxial Fans. Their housing permits mounting like a section of duct . . . with motor, propellor, inlet vanes and all *inside*. Their "Beeline" design lets air pass straight through for highest efficiency. And their light weight reduces installation cost. Write for Bulletin 3533-C for specifications and performance data.

"Buffalo" FIRST FOR FANS

BUFFALO FORGE COMPANY

140 MORTIMER ST. BUFFALO, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont. Branch offices in all Principal Cities

EVAPORATIVE COOLERS AND AXIAL FLOW FANS FOR COOLING MOBILE AND STATIONARY DIESELS

MADISON-KIPP *Automatic* LUBRICATION

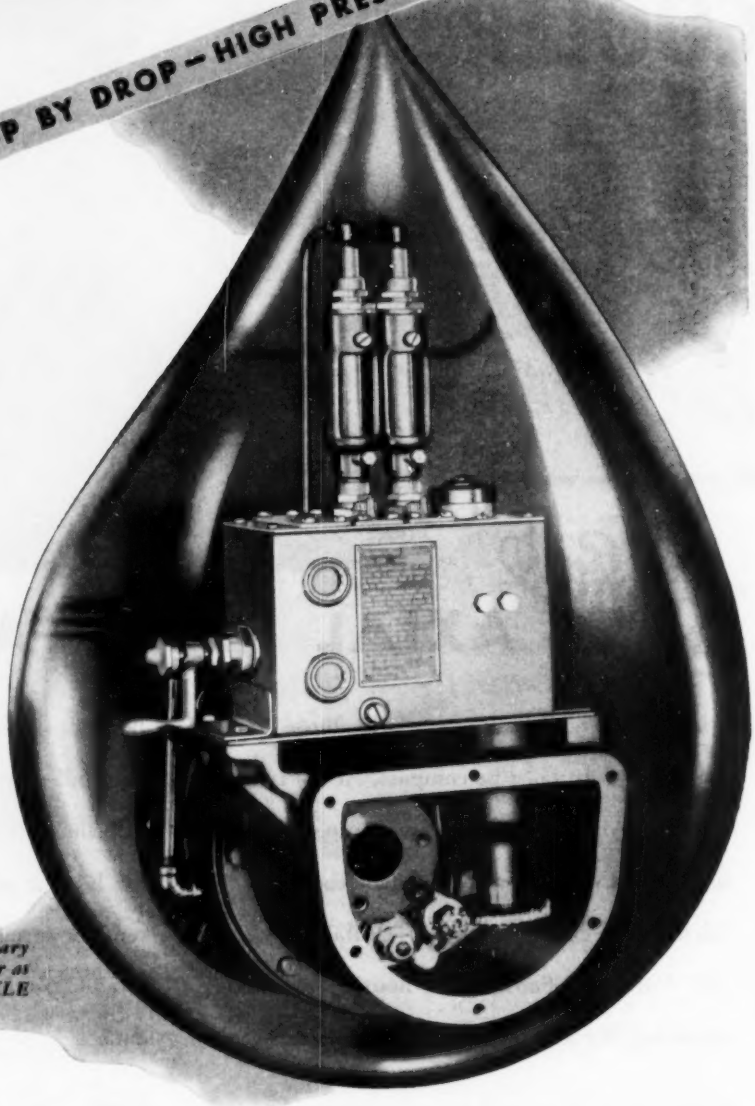
DRIVING SPEED REGULATED TO MACHINE SPEED

MEASURED FEED—DROP BY DROP—HIGH PRESSURE DELIVERY

HERE is a close-up illustration of an actual application of a Bottom Rotary Drive Model SVH Madison-Kipp Lubricator. The operator's responsibility is reduced to a minimum. The machine manufacturer has given his customer a life-time plus value.

Madison-Kipp is the most dependable method of lubrication ever developed and there are models to fit almost every original equipment requirement with automatic drives to fit every application.

Engineering details are, of course, yours for the asking.



Madison-Kipp Bottom Rotary Drive Model SVH Lubricator as applied to Ingersoll-Rand XLE Compressor.

MADISON-KIPP CORPORATION

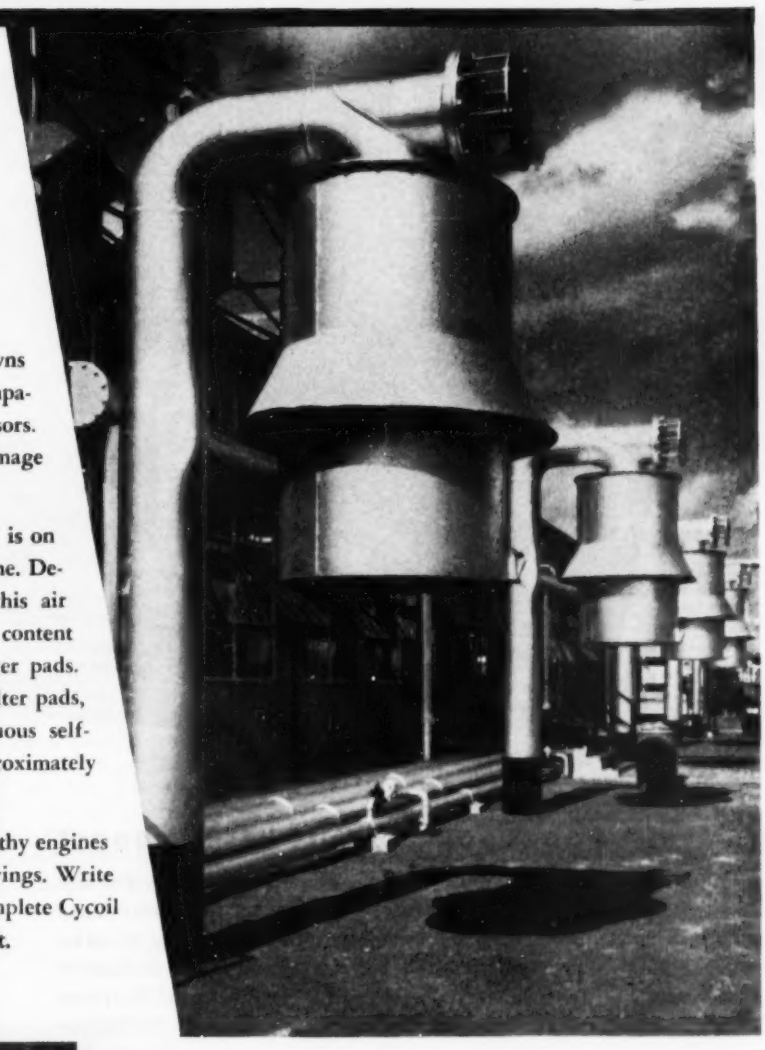
205 WAUBESA STREET, MADISON 10, WIS., U.S.A.

ANCIENS ATELIERS GASQUY, 31 Rue du Marais, Brussels, Belgium, sole agents for Belgium, Holland, France, and Switzerland.

WM. COULTHARD & CO. Ltd., Carlisle, England, sole agents for England, most European countries, India, Australia, and New Zealand.

- *Skilled in* DIE CASTING *Mechanics*
- *Experienced in* LUBRICATION *Engineering*
- *Originators of Really High Speed* AIR TOOLS

"DUST DOCTORS" to Industry



CYCOIL OIL BATH AIR CLEANERS GUARD HEALTH—PROLONG LIFE of ENGINES and COMPRESSORS

Dust damage, resulting in costly shutdowns and repairs, was once accepted as an occupational disease among engines and compressors. Today, "down time" traceable to such damage is an exception rather than the rule.

The reason—Cycoil, the "dust doctor," is on the job practicing true preventive medicine. Designed to operate at 100% efficiency, this air cleaner traps over 90% of the fine-dust content of the air before it even reaches the filter pads. Thus, with added filtration of the dual filter pads, plus positive oil circulation for continuous self-cleaning action, your final result is approximately 100% clean air.

Yes, Cycoil's high efficiency means healthy engines and compressors—along with healthy savings. Write for Bulletin No. 130. It gives you the complete Cycoil story right down to the last bolt and nut.

Today's Best Buy is Better Air!

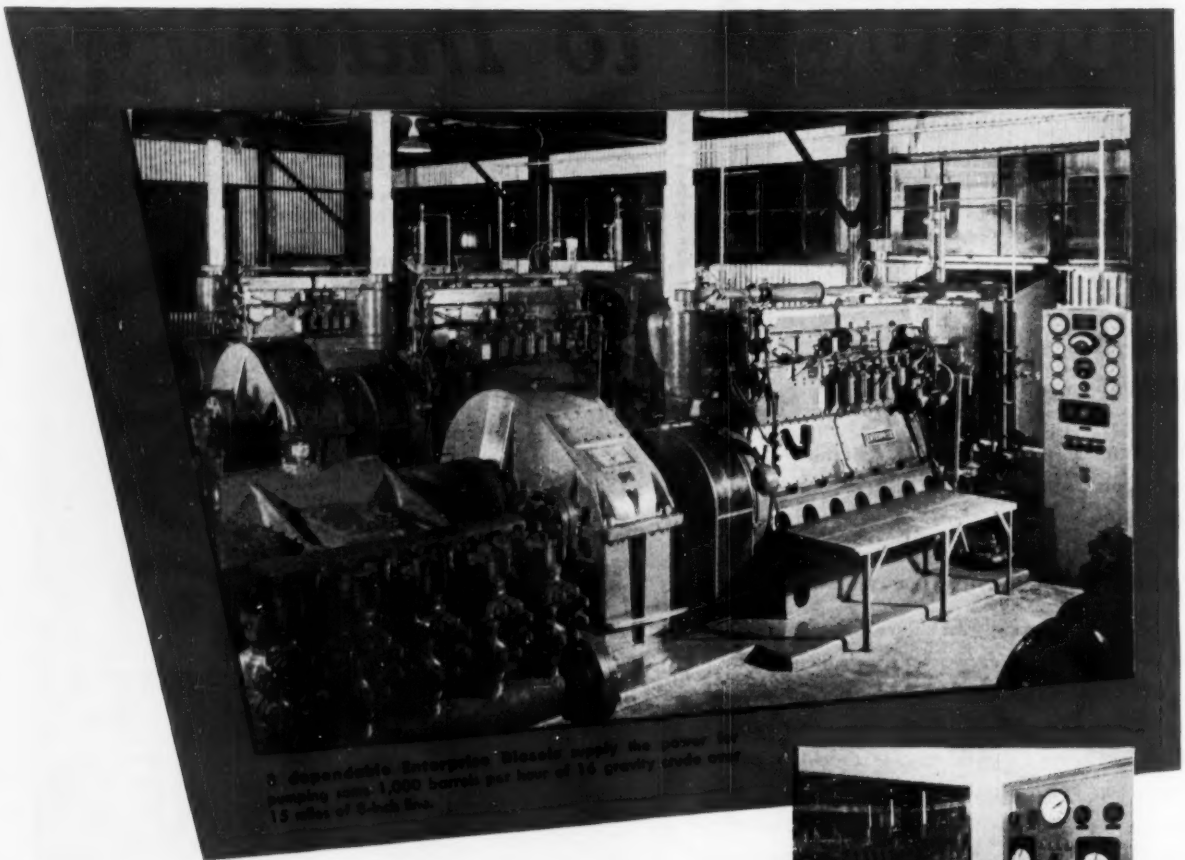
AAF

American Air Filter

COMPANY, INC.

445 Central Avenue, Louisville 8, Kentucky • Darling Brothers, Ltd., Montreal, P. Q.

Crude Diet for Diesels

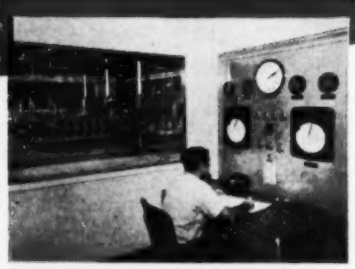


6 dependable Enterprise Diesels supply the power for pumping some 1,000 barrels per hour of 16 gravity crude over 15 miles of 8-inch line.

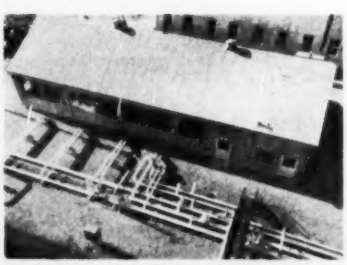
ENTERPRISE POWER FOR A 15 MILE UP-HILL BOOST

An innovation in pipeline pumping power, the *Enterprise* Diesels at Union Oil Company's Antelope Station have set new precedents for operating economy and self-sufficiency. Their ability to take unrefined 16-gravity crude from the pipeline and burn it cleanly and efficiently is the result of exhaustive testing and modifications of basic distillate fuel-burning engine models by the *Enterprise* research and development staff. This work was speeded through close collaboration with Union Oil Company's Research Department, and its contribution of specialized knowledge of fuel and lube oil abilities and properties.

As a result of the highly successful operations at Antelope Station, the pattern has been set for still another pumping plant modernization job at Union's Junction Station, which will be equipped with 6 *Enterprise* DSM-6's—also to operate on crude fuel tapped from the pipeline.



Plant view from central control room. This Enterprise Diesel-equipped pumping station is setting new records for operating economy.

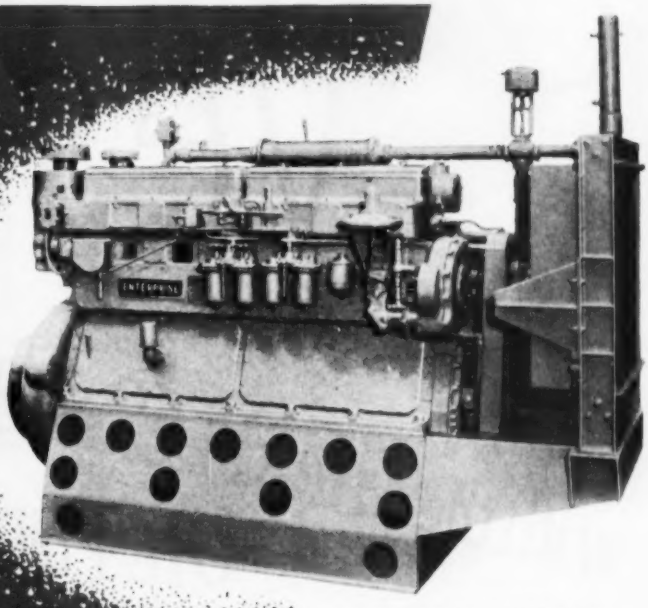


New Enterprise Diesels burning crude oil picked up the load carried for 42 years by a steam plant—with no interruption of operations.

Pays Off

AT UNION OIL COMPANY'S NEWLY MODERNIZED PUMPING STATION NEAR BAKERSFIELD, CALIFORNIA

ENTERPRISE DSM-6 DIESELS BURN HEAVY PIPELINE CRUDE -SAVES 90% in fuel!



Rated 220 HP at 720 RPM, these rugged 6 cylinder Enterprise Diesels run on a diet of unrefined pipeline crude. Despite a viscosity of 800 to 1000 SSU at 122° F., a remarkably high combustion efficiency is maintained —even over extended periods at about half-load.

Replacing the steam pumping equipment which had been in operation for 42 years, modern *Enterprise* heavy fuel engines now drive pumps capable of delivering up to more than 25,000 bbls. per day. These heavy duty, medium speed pumping power units are equipped with heaters, strainers and filters which condition the crude fuel oil for uninterrupted flow through the injection system, and for high and steady combustion efficiency.

Distillate diesel fuel is used for a 15-minute warm up period, and again before shutting down to insure easy starting and clean operation. Fuel costs, as a result, have become a relatively insignificant part of operating overhead, with some 90% less fuel consumed during most of the year than was previously required to operate steam equipment.

These and many other features of *Enterprise* Diesels provide the most satisfactory solution for both new pipeline stations and modernization programs alike.

Write today for full information on *Enterprise* Diesels for pipeline pumping...*the Choice of Power Experts.*

ENTERPRISE ENGINE & MACHINERY CO.
A Subsidiary of General Metals Corporation
18th & Florida Sts., San Francisco 10, California
Offices in Principal Cities

use bunker C as diesel fuel?

yes

with the SHARPLES single-stage OIL PURIFIER

You can save thousands of dollars on diesel fuel costs every year by burning heavy oils in your diesels instead of expensive light fuels... and there is no sacrifice in engine efficiency.

Heavy residual fuels can be effectively purified to diesel fuel requirements, in ONE centrifuging, by the Sharples Single-Stage Oil Purifier. Under action of the greatest centrifugal force commercially available for continuous purification, damaging impurities... silica, tank scale, carbon... are continuously and thoroughly removed from the heavy oils. The non-cratering fuel that results will assure complete engine combustion on diesel engines of all types. Continuous and automatic, the easy-to-clean centrifuge requires a minimum of maintenance or attendance to keep it working on an every-day, 24-hour-a-day shift...

Power plant operators on land and afloat are taking advantage of the Sharples Centrifugal Purifier to slash diesel fuel costs. Your own power plant can undoubtedly benefit . . . it will pay you to investigate.

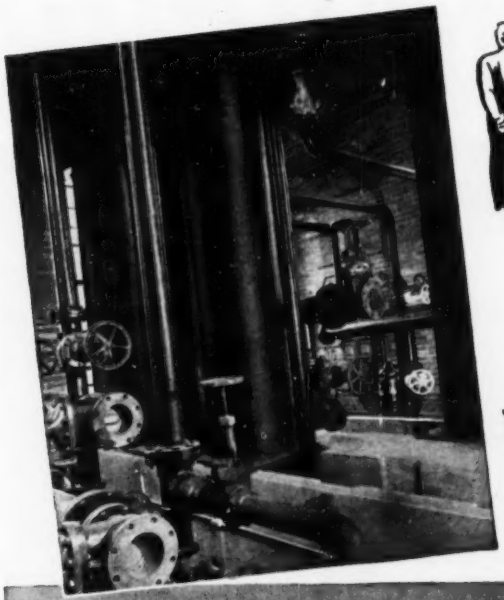
SHARPLES

THE SHARPLES CORPORATION • 2300 WESTMORELAND STREET, PHILADELPHIA 40, PENNA.

NEW YORK • BOSTON • PITTSBURGH • CLEVELAND • DETROIT • CHICAGO • NEW ORLEANS • SEATTLE • LOS ANGELES • SAN FRANCISCO • HOUSTON

Dirty Water can't "Shut-down"...

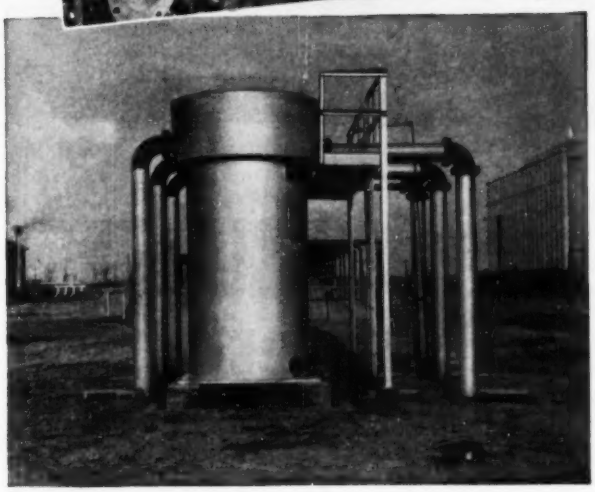
Vogt



film type exchangers

(Condensers—Coolers—Evaporators)

Patent Nos. 1,935,270 - 2,057,597 - 2,424 441



River water, well water or brackish water are all alike to this exchanger *because it can be cleaned* while in operation! The water distributing ferrules need only be removed successively for the cleaning brush or tool whereby the tubes receive additional water which sluices away the dislodged dirt.

Vogt Film Type Exchangers are operating with real economy of first cost, operation and maintenance in power, petroleum, and chemical industries. They serve as Jacket Water Coolers, Feed Water Heaters, Hydrocarbon Evaporators, Sulphuric Acid Coolers, and Sulphur Dioxide Condensers, and can be designed to cool or heat any liquid and to condense or evaporate any fluid.

TOP: *Four units at Newton Falls, Ohio Municipal plant cool water for diesel engines and a lubricating oil cooler.*

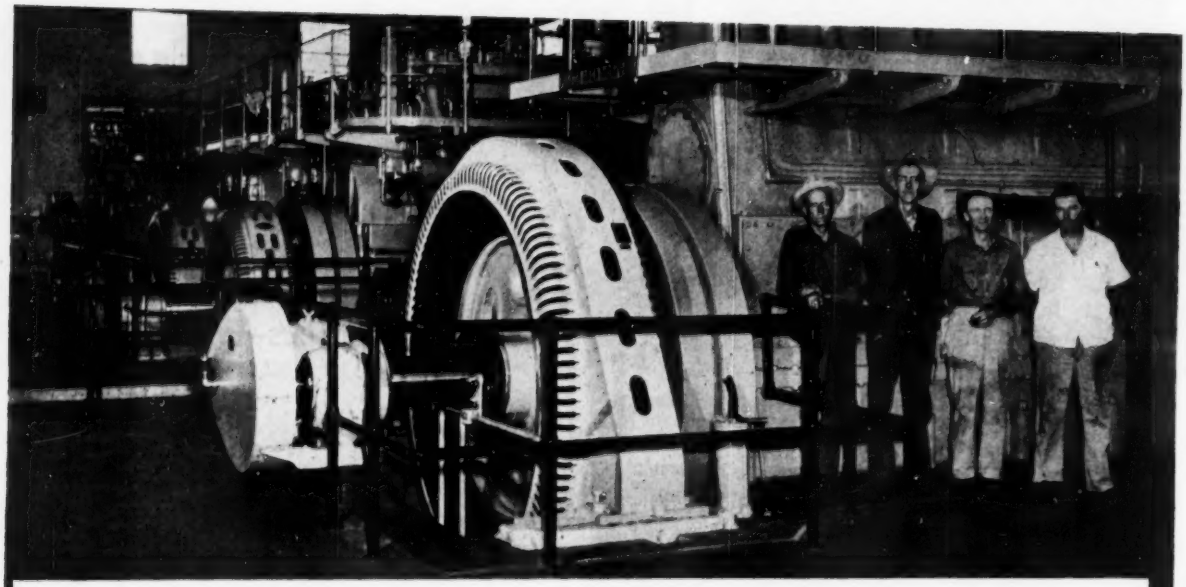
BOTTOM: *Jacket Water Coolers serving engines of 7,300 HP in the compression plant of a Western Oil Refinery.*

[Bulletin HE-7 describes typical installations of Vogt Film Type exchangers and is available upon request.]

HENRY VOGT MACHINE CO., LOUISVILLE, KY.

Branch Offices: NEW YORK, CHICAGO, CLEVELAND, DALLAS, PHILADELPHIA, ST. LOUIS, CHARLESTON, W. VA.

NO STUCK RINGS OR CARBON, NEGLIGIBLE PISTON WEAR... *AND NO OIL CHANGE IN 14 YEARS!*



In 1937 the Municipal Light Plant, in Cushing, Okla., put Sinclair RUBILENE Heavy in service in its diesels. The oil has never been changed since! For semi-annual laboratory analyses of samples have always shown the oil to be in excellent condition.

Inspections of the diesels have revealed no stuck rings, negligible piston wear. The crankcase and upper portions of the cylinders are exceptionally clean and bright, with no signs of carbon or deposits.

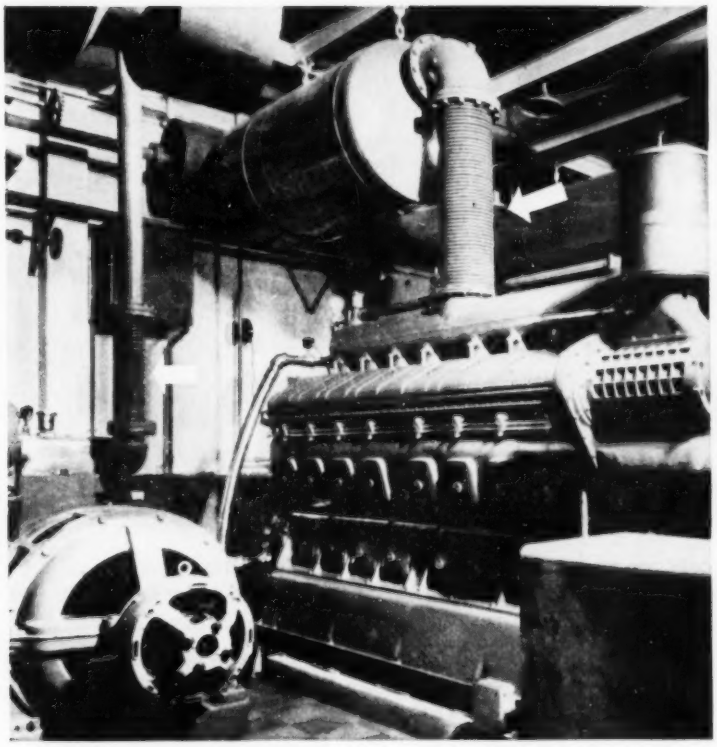
This is typical of the job that *RUBILENE*® has been doing for some 40 years throughout the nation. No wonder RUBILENE is first choice of many diesel engineers and has won the endorsement of diesel manufacturers.

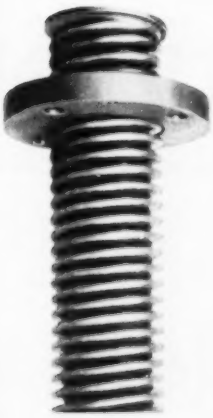
SINCLAIR DIESEL OILS save wear and replacements

For more details, see your nearest Sinclair Representative, or write direct to Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.

Engineering logic says:

"Use American Flexible Exhaust Hose!"





Two factors *must* be considered in every diesel engine exhaust line: vibration, and the stresses created by wide temperature changes in the line. A third factor which *ought* to be considered: ease of installation and servicing.

American Flexible Steel Exhaust Hose—either corrugated or interlocked—solves all three problems. This sturdy, *flexible* steel hose absorbs, and thereby isolates, vibration. It likewise copes with thermal expansion stresses—prevents possibility of sheared bolts or cracked piping. And as for installation, there's no easier way to make an offset connection than with American Flexible Metal Exhaust Hose.

For full details on American Flexible Steel Exhaust and Air Intake Hose for diesel installations—marine and industrial, write for Bulletin EH-50. The American Brass Company, American Metal Hose Branch, Waterbury 20, Connecticut. In Canada: The Canadian Fairbanks-Morse Company, Ltd. 51253

OTHER PRODUCTS FOR DIESEL USE

Flexible tubing with wire braid cover for: starting air, circulating water, fuel oil, lubricating oil. Tubing available in bronze or carbon steel. Assemblies complete with fittings.

wherever connectors must move

ANACONDA
from mine to consumer

American **FLEXIBLE METAL HOSE AND TUBING**

POWERHOUSES of EFFICIENCY...

AC GENERATORS
20 KW through 150 KW at 1200 RPM
20 KW through 200 KW at 1800 RPM

DELCO GENERATORS

When you consider the low annual cost and high efficiency of a Delco generator you will know why they are favored by engine manufacturers and assemblers. Low cost per year for long service operation—plus the many advantages of design and construction—has given Delco generators their reputation for dependability and efficiency. Many of their features of construction and items of equipment . . . often classed as *extras* . . . are *standard* with Delco. And they pay off handsomely for the ultimate owner.

Power range of Delco generators for engine-driven stand-by and portable equipment is from 20 through 200 KW—AC and DC—1200, 1500 and 1800 RPM. Any of the sales offices listed below will be glad to supply detailed information.

DC GENERATORS
20 KW through 90 KW at 1800 RPM
20 KW through 75 KW at 1500 RPM
20 KW through 60 KW at 1200 RPM

DELCO
DAYTON OHIO

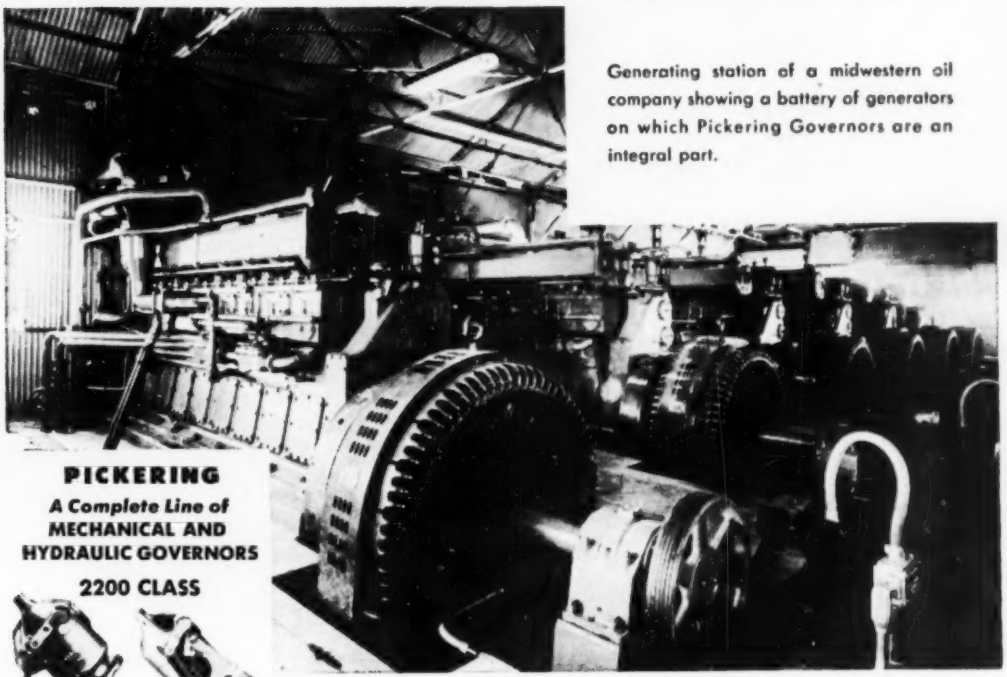
DELCO GENERATORS

DELCO PRODUCTS
Division of General Motors Corporation, Dayton, Ohio

SALES OFFICES: Chicago • Cincinnati • Cleveland • Dallas
Detroit • Hartford • Philadelphia • St. Louis

PICKERING

Synonym for dependability since 1862



Generating station of a midwestern oil company showing a battery of generators on which Pickering Governors are an integral part.

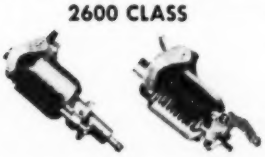
PICKERING

A Complete Line of
MECHANICAL AND HYDRAULIC GOVERNORS

2200 CLASS

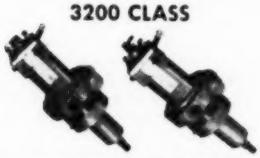
Constant Speed Variable Speed

2600 CLASS



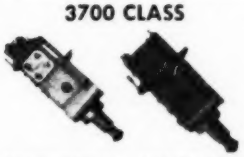
Constant Speed Variable Speed

3200 CLASS



Constant Speed Variable Speed

3700 CLASS



Constant Speed Variable Speed

For 89 years, Pickering Governors have met and anticipated the needs of American Industry. They have more than established a reputation for fully-dependable, long-term service under every type of operating condition.

Today, Pickering stands ready to supply the right governor for the job — to supply the governor that will maintain operating efficiency at its peak regardless of service conditions.

To consult Pickering Engineers may be your passport toward more efficient and economical operation of diesel equipment.

THE PICKERING GOVERNOR CO.

Established 1862

88 LLEWELLYN AVENUE · BLOOMFIELD, NEW JERSEY

7614

"Some 15,000 employees in all branches of our organization are taking advantage of the Payroll Savings Plan . . ."

SPENCER LOVE
Chairman of the Board, Burlington Mills

"The Payroll Savings Plan is one of the important personnel services offered to the employees of our company. At the present time some 15,000 employees in all branches of our organization are taking advantage of this splendid plan for systematic savings. In times of national emergency this plan assists in stabilizing the economic life of the employee, the community and the nation."

Last call for the 1951 Defense Bond Campaign!

While the campaign was scheduled for six weeks, beginning Labor Day, the *accounting period* will include all Payroll Savings Plan bond purchases and enrollments in September *and October*.

If *you* haven't conducted a person-to-person canvass to put a Payroll Savings Blank in the hands of every man and woman in *your* company there is still time to join the thousands of companies which have added nearly a million employees to the Payroll Savings Plan through person-to-person canvasses.

Phone, wire or write to Savings Bond Division, U. S. Treasury Department, Suite 700, Washington Building, Washington, D. C. Your State Director will give you all the help you need—application blanks, posters, envelope stuffers, personal assistance.

Give your employees an opportunity to save for their future and at the same time, help to maintain America's economic security—put an application blank in their hands.

Results of a few recent person-to-person canvasses

Firestone Tire and Rubber Company (40,000 employees), 87% participation; Universal Atlas Cement Company, 67.8% of 4,789 employees . . . Martha Mills, 71% of 2,200 employees . . . Lit Brothers, 52% of 3,600 employees . . . Delta Air Lines, 65% of 2,100 employees; Aerojet Engineering Corporation, 78.1% of 2,000 employees . . . Brown-Lipe Chapin Division of General Motors, 87% of 1,750 employees; Fabricast Division, General Motors, 85% of 1,700 employees.

Person-to-person canvasses now under way include:

	Number of Employees
38 Major Railroads	993,142
Radio Corporation of America	40,000
Owens-Illinois Glass Company	25,000
Cudahy Packing Company	17,000
Pacific Gas and Electric	17,000
Willys-Overland	6,750
Owens-Corning Fiberglas Corp.	6,500
White Motor Company	6,500
Fruehauf Trailer Company	5,700

The U. S. Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and

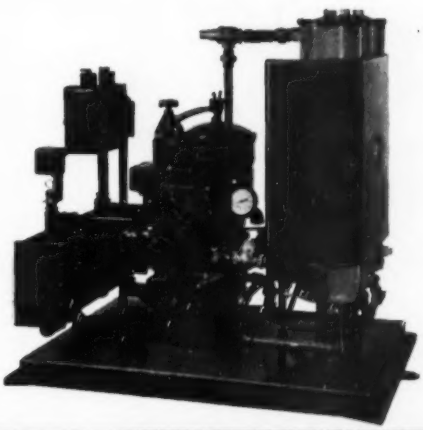
DIESEL POWER AND DIESEL TRANSPORTATION

WITH THE "PURI-FILTER" CRANK CASE INSPECTION IS ALMOST A PLEASURE!

Inspection of a crank case is never a pleasant duty, but when the diesel lubricating oil has been purified by means of a De Laval "Puri-Filter," the crank case remains surprisingly free of excess carbon even after long periods. So inspection is ***relatively*** easy.

The De Laval "Puri-Filter" is a combination of a De Laval "Uni-Matic" Oil Purifier plus Fram "Filcron" Filters. The double cleaning action of centrifugal force and filtering removes all three contaminants: dirt, water and carbon. In the centrifuge, the solids are thrown out of the oil and stored in the bowl until cleaning is necessary. Simultaneously, water discharges to waste from the centrifuge.

The centrifuged oil then passes through the filters which polish it so completely that it is ***visibly*** clean. Oil thus purified provides maximum protection to engine bearings.



THE DE LAVAL SEPARATOR COMPANY
Poughkeepsie, New York 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

DE LAVAL OIL PURIFIERS

FOR DIESEL LUBRICATING OIL

EVERYBODY'S TALKING ABOUT CUTTING DIESEL OPERATING COSTS...

. . . more power with less fuel . . .
. . . low cost maintenance . . .
. . . lesson in cost reduction . . .
. . . cut Diesel overhaul 50% . . .

How about cutting costs of Diesels?

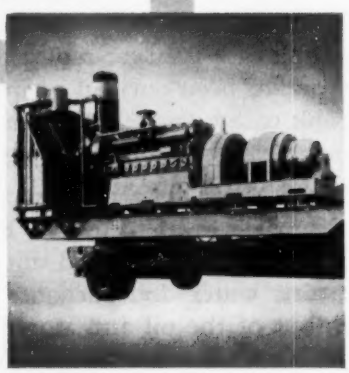
BFM rebuilt diesels save you up to ½ the cost of new engines—carry the same guarantee—can be delivered immediately! BFM also builds diesel equipment to your own specifications!

BFM techniques require that the entire engine be taken down to the original cast and all foreign matter removed. The diesel is rebuilt from the original cast and test run. Hydrostatic tests are performed on the block, head, manifolds; and with marine diesels, on the heat exchangers. All moving parts including crankshaft, camshaft, liners, pistons, etc. are micrometered to insure original specifications. BFM rebuilt diesels are guaranteed for 300 operating hours or 90 days from date of delivery whichever is prior.

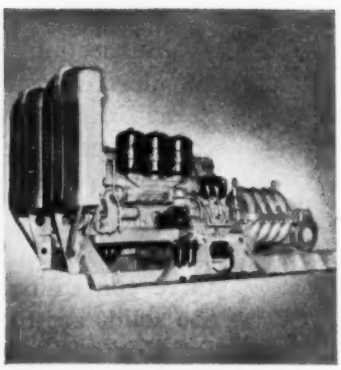
OUR CLIENTS ARE WORLD-WIDE

Allied Chemical
U. S. Army, Corps of Engineers
U. S. Navy
Moore-McCormack Lines
Bethlehem Steel Co.
Radio Corp. of America
Standard Oil Co. of N. J.
Merritt-Chapman & Scott Corp.

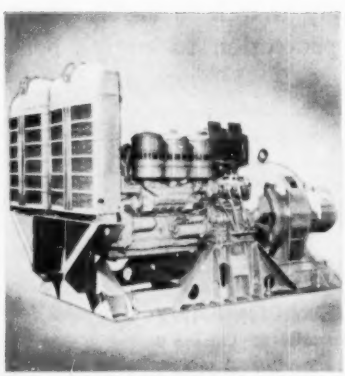
Immediate Delivery of All Famous Makes. Early Deliveries on Custom-Built Equipment. Complete Stock of Parts for GM and Gray Marine as well as accessories.



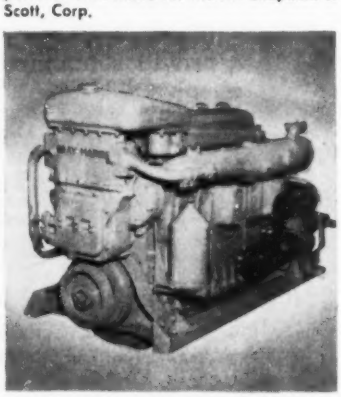
300 KW GM Cleveland Model 8-268A Radiator Cooled Portable Power Plant. The largest portable Diesel electric plant ever made.



Twin 6-71 GM direct connected to Gould 8" 4 stage Model 3330 centrifugal pump. Semi-portable unit. Made for Merritt-Chapman & Scott, Corp.



150 KW Twin GM Model 671 for Idlewild, New York's International Airport. Emergency standby plant for lighting and power.



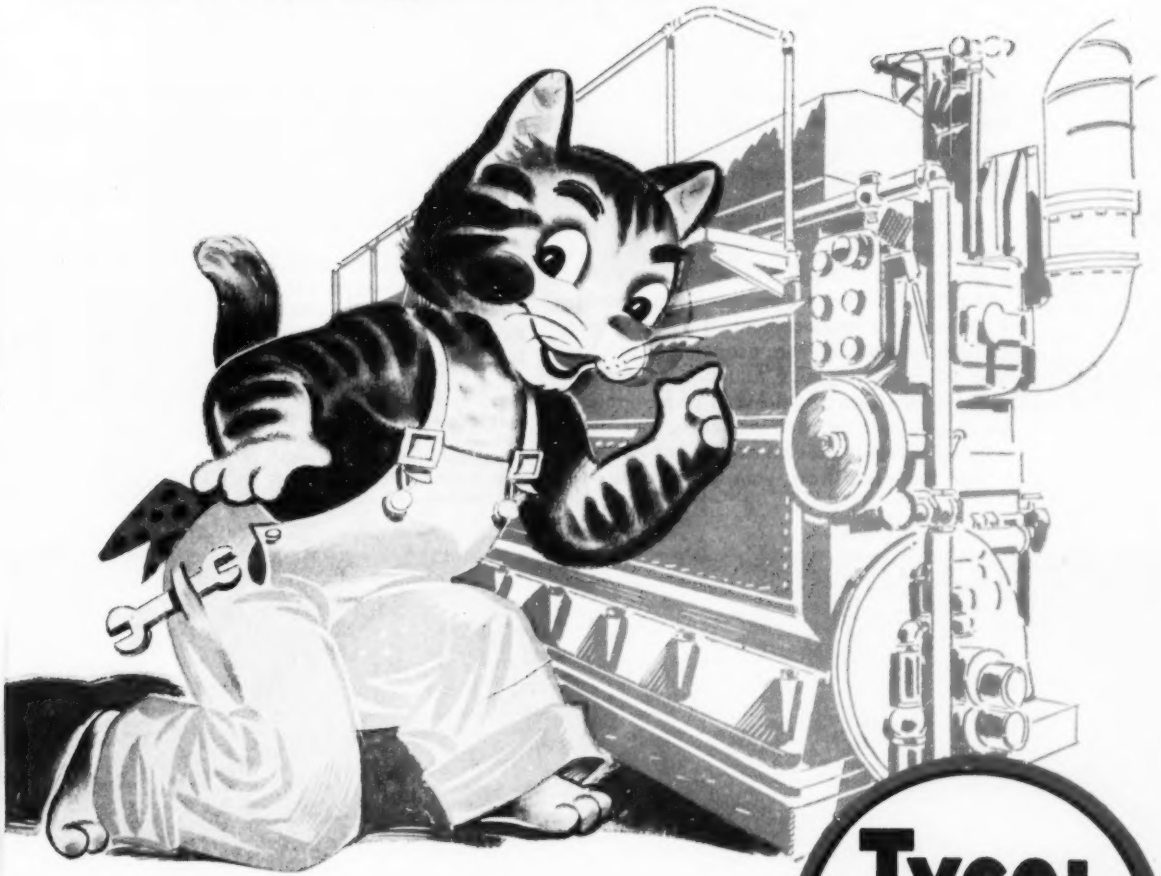
Gray Marine Model 671 propulsion unit with any reduction desired. Complete stock of parts.

BFM INDUSTRIES INCORPORATED

LET US AID IN ENGINEERING YOUR NEEDS. WRITE OR WIRE US TODAY!

BFM INDUSTRIES INCORPORATED
2124 MILL AVENUE, BROOKLYN 34, NEW YORK

"Tycol Diesel Oils give smooth performance... assure top engine service"



Absolutely correct! Tycol Diesel Oils are a must for satisfactory lubrication. Their degree of refinement – their service endurance – and their high stability mark them outstanding.

Tycol Diesel Oils have more than proved themselves after years of operation in Diesels of every description and in all types of service . . . from high-speed units for industrial, railway and marine uses where a heavy-duty or detergent oil is necessary to low-speed Diesels where a non-additive lubricant can be used. Yes, sir, there is a Tycol Diesel Oil scientifically engineered for every Diesel application – engineered to do the job better . . . at lower cost.

Your nearby Tide Water Associated office will be glad to give you complete information. Wire or phone today.

TYCOL

INDUSTRIAL LUBRICANTS

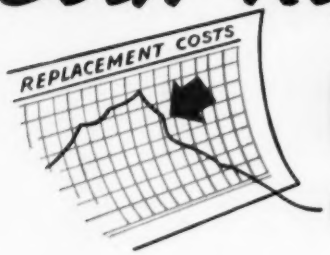
Boston • Charlotte, N. C. • Pittsburgh
Philadelphia • Chicago • Detroit
Tulsa • Cleveland • San Francisco

TIDE WATER ASSOCIATED OIL COMPANY

17 BATTERY PLACE - NEW YORK 4, N.Y.

SEND FOR A FREE COPY OF "TIDE WATER ASSOCIATED LUBRICANIA"

Beat Replacement Costs...



GUN IRON CAST PARTS

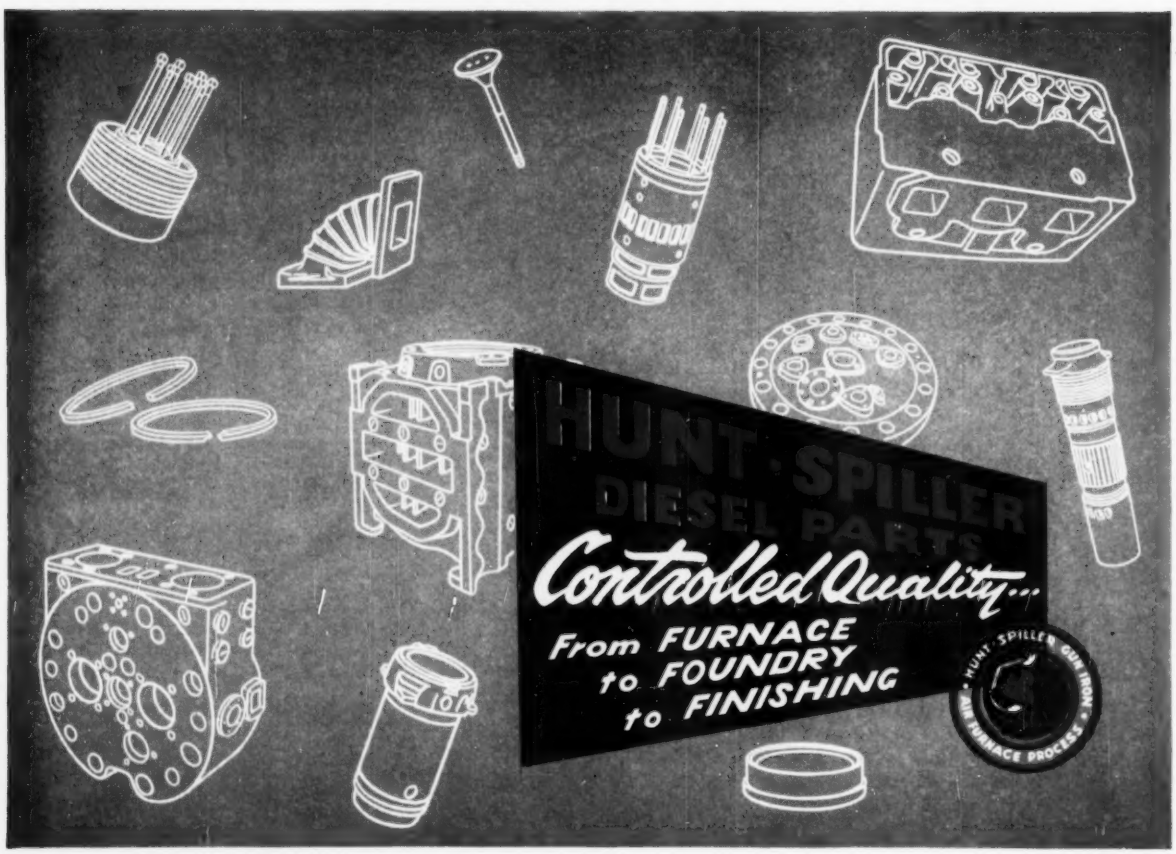
Gun Iron is a super-refined iron, highly resistant to frictional wear, high heat, pressure, and erosion. It combines outstandingly those engineering properties that spell long, economical service.

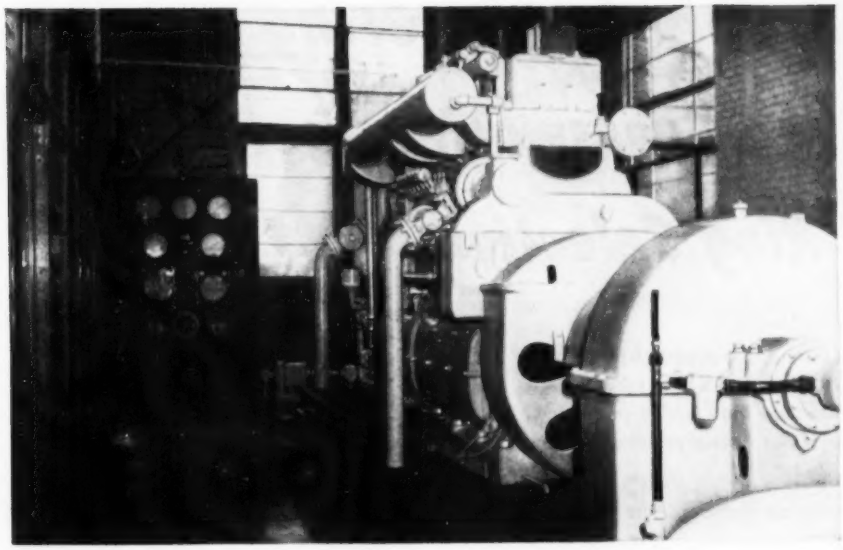
You can rely on diesel parts cast of Gun Iron to serve you better longer, to provide high-measure protection against costly operating failures. That means more than worthwhile savings in replacements. It means longer periods of trouble-free, economical operation, one of the keys to more profitable operation. Today, in the face of equipment shortages, high maintenance costs, long economical service takes on added importance.

For the most from *your* cast parts—to beat replacement costs, investigate economical Gun Iron. Our engineers stand ready to assist you in determining its value in your applications. **HUNT-SPILLER MANUFACTURING CORP., 373 Dorchester Ave., Boston 27, Mass.**

Canadian Representatives: Jos. Robb & Co., Ltd., 4050 Namur St., Montreal 16, P.Q.; *Export Agents:* International Rwy. Supply Co., 30 Church St., N.Y. 7, N.Y.

***HERE IS A PRACTICAL GUIDE** for the user of iron and steel castings . . . 24 pages of technical data on many types of metals and alloys. Write for your free copy.*





21,716 hours without forced shutdown

...and still going strong

that's the record of this Alco Diesel Engine at Barnett Station of Shell Products Pipe Line

Listen to Mr. C. C. Curvey, chief operator at Barnett, Ill., speaking:

"The unit operates 24 hours a day and is never shut down except for the annual routine inspection and overhaul. . . . Not only have we boosted capacity of this line 15%, but operating and maintenance costs have been much reduced."

The Barnett station is equipped with a single Alco diesel—replacing a total of 3 old-type engines. This rugged Alco diesel provides power for pumping 1,050,000 barrels a month through the 8-inch pipe line. It's a 6-cylinder, 4-cycle engine with 12½ inch bore and 13 inch stroke, rated at 810 hp and 650 rpm.

Such power and performance can be yours, too, if you install Alco Diesel Engines to meet your pipe line pumping requirements. Your nearest Alco engineer will be glad to help. Call him today at sales offices in New York, Beaumont, Chicago, Cleveland, Houston, Kansas City, San Francisco, Schenectady, St. Louis.

SPEED Vs. WEAR

Remember, since piston speed and journal travel per minute are both almost the same in medium speed and slow speed engines, wear is equivalent as well. Not only do you get unequalled dependability with Alco Diesels—you get long wear and low maintenance costs, no matter how difficult the service conditions.

ALCO DIESELS

THE MARK OF MODERN ENGINEERING

AMERICAN LOCOMOTIVE COMPANY

Cook's Job-Engineering

Takes the Guesswork out of Piston Ring Selection!

What adjustments have to be made when shifting over to heavy fuels? Is there a way to overcome ring breakage? How can blow-by be prevented? What can be done about excessive lube oil consumption?

You get the answers to these and many other questions relating to your operations when a Cook field engineer makes a "job-engineered" survey of your ring requirements. Unlike the old-fashioned trial-and-error methods of ring selection and application, Cook's "job-engineering" provides a scientifically sound approach to these problems by applying the data and experience gained from an extensive and costly program of research and analysis of piston ring performance under virtually all conditions of service. It's value to you lies in the fact that Cook "job-engineering" enables you to get ring recommendations tailored exactly to your own specific operating and engine conditions.

Whatever your needs, remember, too, that Cook can supply you with the style of ring and the type of ring material needed to do the job.

Call in a Cook field engineer today and have him make a "job-engineered" survey of your plant.

★ ★ ★

C. Lee Cook Mfg. Co., Incorporated, Louisville, Ky. Branch offices in Baltimore, Boston, Chicago, Cleveland, Houston, Los Angeles, Mobile, New Orleans, New York, San Francisco and Tulsa.

COOK
GRAPHITIC IRON
PISTON RINGS

Cook Graphitic Iron is a proven ring material that assures maximum ring life and minimum cylinder wear.

SEALING PRESSURES SINCE 1888

Diesel Power

and DIESEL TRANSPORTATION

***Brian P. Emerson,* Editor**

Robert E. Newberry, Associate Editor

Established in 1923

GEORGE R. BRIGHTON
President

JAMES E. JONES
Vice President & Treas.

G. RENFREW BRIGHTON
Vice President & Sec'y.

ARNOLD B. NEWELL
Vice President

ARTHUR N. GODING
Business Manager

MICHAEL RUBIN
Circulation Mgr.

L. B. HAMMOND
Western Manager
30 North LaSalle St.
Chicago 2, Ill.
Randolph 6-1843

M. D. PUGH
Pacific Coast Manager
2721 North Marengo Ave.
Altadena, Calif.
Sycamore 7-2894

Transatlantic Publicity Ltd.
British Representatives
20/21 Broad Street Ave.
Blomfield Street
London E.C. 2, England

Subscription Rates

	Single Copies	1 year	2 years	3 years
U. S.	35¢	$3.00	$5.00	$ 6.00
Canada	40¢	4.00	7.00	10.00
Foreign	40¢	5.00	8.00	11.00

Diesel Power & Diesel Transportation is indexed regularly by Engineering Index, Inc. and is available in microfilm editions from University Microfilms, Inc., Ann Arbor, Michigan.

Vol. 29 No. 10 October, 1951

Contents

Cover Photo:
Sharpening a tungsten-carbide tool for the Van Norman "Pin Shop." A lapping plate incorporated in the spindle and a holding fixture insure accuracy of cutting edges.

EDITORIAL

False Economy 47

ARTICLES

Maintenance and Diesel-Electric Locomotive Motors and Generators 49
One Way to Save Money on Repairs—Spend It on Pneumatic Tooling 54
Hard Chrome Surfacing for Crankshafts 56
Regrinding and Metallizing Crankshafts 59
Are You Sure It's Your Injection Equipment? 62
Servicing Engines Equipped with Sleeves 64
Pin Fitting By Comparison 68
Trouble Shooting 72
Why Pyrometers? 75
Align Boring Main Bearing Saddles 78

FEATURES

New Products 82
Field Notes 92
Advertisers' Index 106

Diesel Publications, Inc., 192 Lexington Avenue, New York 16, N. Y.

Diesel Power and Diesel Transportation is published monthly at Orange, Conn., by DIESEL PUBLICATIONS, INC., 192 Lexington Ave., New York 16, N. Y. Tel. Murray Hill 3-9874. Cable address: Dieselpub, N. Y. Subscription Prices: United States, $3.00 per year; Canada, $4.00; Foreign, $5.00. Single copies, United States, 35c. Bound volumes by previous years, $15. Subscribers are requested to send both the old and new addresses when ordering change in mailing.

Copyright, 1951, by Diesel Publications, Inc.

HOW TO GET MORE OUT OF YOUR PLANT...

You can step up production in your plant—*without any additional capital outlay*—by increasing machine efficiency, improving materials-handling, and instituting programs for personnel training and quality control.

Socony-Vacuum can assist you in all of these operations. Our program of Correct Lubrication – based on 85 years' experience working with industry – includes . . .

- Analysis of all your production, power-generating and materials-handling machinery.
- Recommendations of the right oils and greases for every moving part of all your machines . . . and for rust and corrosion prevention.
- Training for your lubrication personnel.
- The full facilities of our research laboratories, and the services of our staff of lubrication engineers—largest in the industry.
- Progress reports on the production benefits gained through improved lubrication.

Why not get more out of *your* plant – with Correct Lubrication? Call your Socony-Vacuum Man.

Socony-Vacuum

Correct Lubrication

WORLD'S GREATEST LUBRICATION KNOWLEDGE AND ENGINEERING SERVICE

SOCONY-VACUUM OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION

Editorial:

False Economy

LET'S talk a little bit about economy as it ties in with the theme of this issue — Tooling and Maintenance. These are important subjects at any time, particularly so at this time and apt to become more so in the immediate future. Everything is going higher — a farm tractor, a bulldozer, a bus or truck, a locomotive, or an engine for a power plant. Even the demands for the services of these items are going higher.

You will say that revenues are going higher too, and properly so, but this also means that "down-time" represents a greater loss. It is no longer a question of "can I afford a good system of preventative maintenance and the facilities as well as the tools for repair", but a case of "can I afford not to have them."

Check the cost of capable, trained personnel and add to it the minor costs of routine maintenance items. Then, determine the cost of various engine components and add to this the labor involved for repair—plus—the loss of revenue during down-time. An added increment to the latter is the lead time required to get the parts. Now, compare the two and again ask yourself, "Can I afford not to have them?"

Consider personnel: They can be classed as "tools" to do the required job and certainly are a part of "maintenance". How do you evaluate the worth of such "tools"? All too frequently the idea seems to be to under-valuate them and get them as cheaply as possible. Here is a prime example of false economy.

You get what you pay for. Diesel operation, today, is a far cry from what it used to be. It is far more complex and the economic picture is tighter. Improved performance and higher output per cylinder has been achieved at the expense of some complication of the engines and accessories. In other words, greater skill is necessary. In twenty years, the cost of diesel fuel has risen from $0.03 per gal. to over $0.12 in many places. This places a premium on fuel economy which means well run engines.

A higher level of technical skill is needed today: If you want high level operation, you must pay for it. Municipal power plants are notoriously short sighted in this respect. They will frequently take a plant worth a few million dollars and upon which the welfare of the community depends and intrust it to someone on the basis of "Well, he's the best we can get for what we want to pay."

We can cite an instance where a Village Board did not boggle at paying a fat fee to a firm of consulting engineers for confirmation that they needed a new engine — a fact that anyone in the plant could have told them by watching the meters at peak load when all the engines were on the line. Yet a salary raise was denied to the chief engineer who had lifted the plant out of the doldrums to a high level of efficiency during his tenure of office. A typical reason, "Why, he's already the highest paid man in the village."

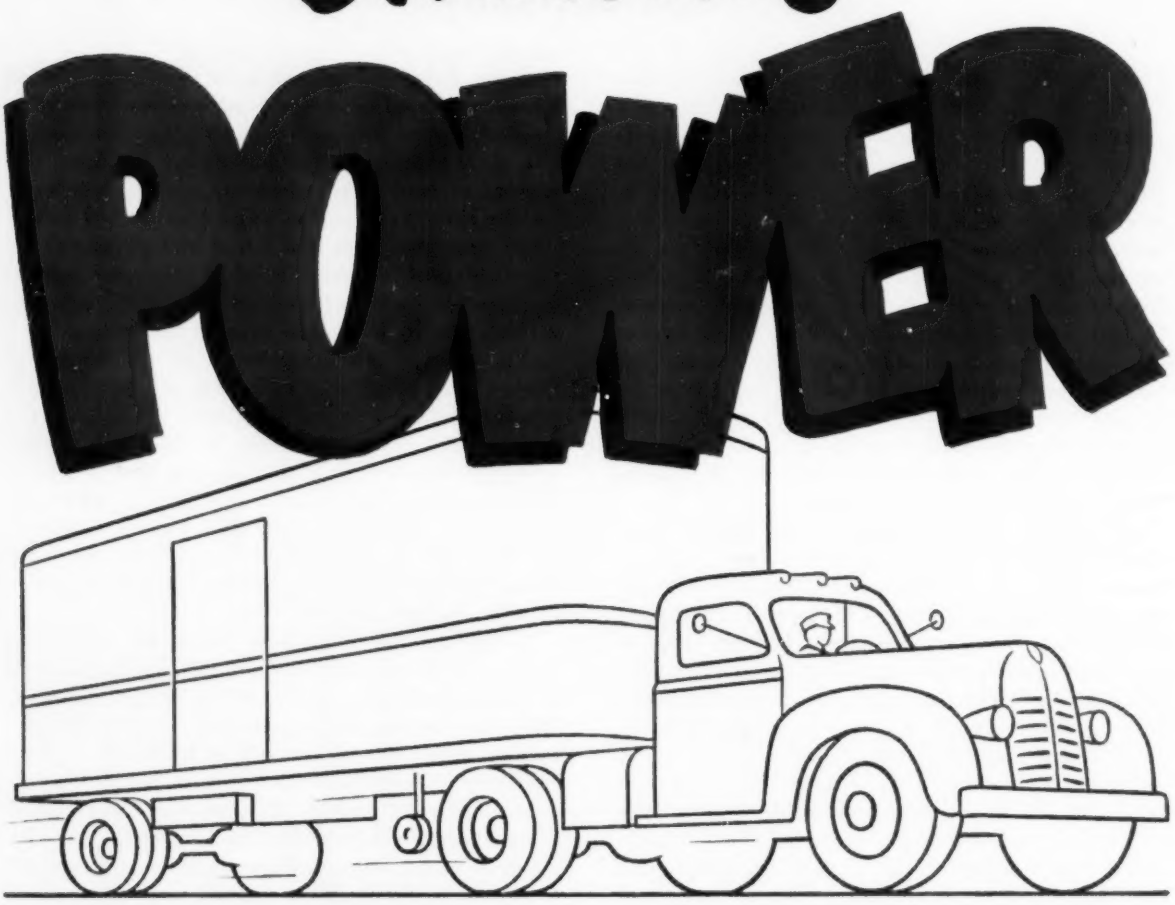
Enlightened management in all phases of industry are finding that well paid, competent men are the cheapest in the long run. We know of a contracting firm, operating a fleet of diesel-powered construction equipment, that keeps a lubricating engineer on the staff. Expensive? Perhaps on the books, but they have recognized the fact that the trouble he keeps from the door would be more costly, even though it never appears on the ledger.

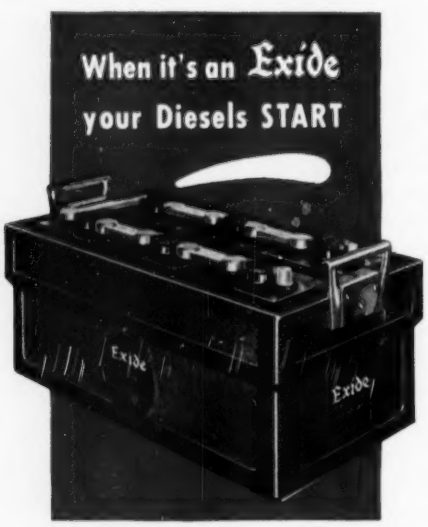
"Fine for the big fellow, but I'm a little guy and can't afford it." This frequently heard comment is absolutely invalid. It is the little fellow who can't afford the expense of down-time. One tractor down out of three is a lot more serious than one out of 50 or 100. First, he must develop a constant *awareness* of the necessity for planned maintenance. This "constant awareness" is the hardest part. Any number of good sources of technical assistance — engine and equipment builders, oil company representatives, current texts — are available to help him implement the program.

Tooling is subject to false economy, too. We remember a case in point observed in a machine shop working on connecting rod forgings. The shop foreman proudly showed the owner how by means of an ingenious arrangement it was possible to drill an oil passage in some rods to the proper size, using available drills, thus saving the cost of a new one. The owner hit the ceiling. The foreman had neglected to consider that set-up and drilling time had been doubled and that tie-up of the deep hole driller would cut production in half. Increased labor costs and loss of production would pay for a lot of new drills of the proper size.

These comments point out one thing: False economy is generally caused by the failure to consider and evaluate *all* the facts. Long term planning is the answer. With a policy of expediency, this year's balance sheet may look fine, but how about next year's—and the next?

STARTING POWER





FOR ALL-WEATHER STARTING
GIVE THE JOB TO Exide

In good weather or bad, in hot climates or cold, in normal service or where the going is extra tough . . . Exide Batteries continue to prove their ability to handle any and every diesel starting assignment. They're designed specifically for the job. And back of them are years of close cooperation with builders of diesel-powered equipment. In Exide Diesel-Starting Batteries you get:

QUICK BREAKAWAY and fast acceleration of engine to firing speed.

LOW DEPRECIATION due to their extra long life.

LOW COSTS of operation and maintenance.

RUGGED CONSTRUCTION for rough usage in hard service.

Use Exide Diesel-Starting Batteries for all heavy-duty service—in buses, trucks, tractors, off-the-highway equipment, ships, power plants, diesel-electric locomotives.

THE ELECTRIC STORAGE BATTERY COMPANY
Philadelphia 2
Exide Batteries of Canada, Limited, Toronto
"Exide" Reg. Trade-mark U. S. Pat. Off.

1888 . . . DEPENDABLE BATTERIES FOR 63 YEARS . . . 1951

Maintenance and Diesel-Electric Locomotive Motors and Generators

*by J. W. Teker**

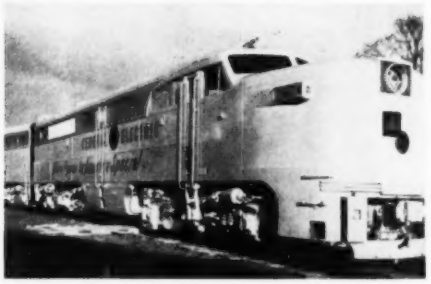


Fig. 1—Alco-GE 2250-hp. standard passenger locomotives.

A condensation of the author's address to the St. Louis Railroad Diesel Club in February of this year. Diesel clubs throughout the country are devoted to the dissemination of knowledge gained through actual operating experience. This interchange of ideas helps to improve the operating and maintenance records which determine the true value of equipment and points up specific needs in the field. To this end, the diesel clubs are invaluable.

Early designers were intent primarly on getting a diesel-electric locomotive which would work. Being without the benefit of this experience, they designed and built a locomotive which was similar, even in appearance, to the electric locomotive of that day. The diesel engine-generator set not only furnished the power for the traction motors, through the main generator, but also drove a large auxiliary generator to supply power for the electrically-driven air compressor, radiator fan, traction-motor blowers and other accessories—thus following electric locomotive practice. One serious drawback was that the heavy auxiliary power demand greatly reduced the power available for traction. The weight and cost of the electrically-driven auxiliary equipment was also against this arrangement. Even now, however, these early locomotives have remarkable operating records.

The trend changed toward lightweight designs in which the auxiliaries were driven either directly from the engine or by belts. The simplicity of this scheme is hard to beat, especially on switchers. Here the power required for exciters and blowers is low enough to be easily handled by belts. The application is simple, easily understood, and readily available for inspection and maintenance. The most satisfactory multiple-belt drive performance is obtained from matched-length belts in sets. In addition to dividing the load, matched belts avoid excessive belt tension and reduce the possibility of overloading bearings. Some railroads use a belt matching machine and keep matched sets according to sizes, hung on pegs.

Road locomotives, with higher auxiliary power demands and operating over long runs, present more of a problem. Here again maintenance experience justified another step in design—a partial return to the original idea of electric motor drive for cooling fans, etc. Details differ but one common idea prevails: the air compressor is still driven direct from the diesel engine. Lower compressor maintenance costs would probably result if anyone could justify a separate electric drive for it.

The rapid development and widespread distribution of diesel-electric locomotives in recent years has resulted in many maintenance forces being required to work on the more modern types as well as the older designs. This creates the problem of becoming familiar with all the models and educating the workmen. There is also the spare parts headache—trying always to have the part needed, while avoiding excessive and inactive stock of parts. The railroads which have had the most experience with diesels, and therefore have done the most to foster their development, feel the effect of this diversity of design most. The builders are aware of this service and maintenance problem. Currently it is an important factor in all design considerations. How to standardize locomotives and yet not arrest development is a real problem.

The nature of the principal electric machines on a locomotive offers one approach to the problem. Certain parts, such as brushes, bearings and gears are expendable—they wear out. This is the class of parts most necessary to standardize for facility and economy in maintenance. This principle was applied to the line of 1600-hp. and 2250-hp. Alco-GE locomotive units, (see Fig. 1) on which the rotating equipment differs essentially only in the generator. The same generator is used on the 1600-hp. road switcher and freight units. Another generator of greater capacity is used on the 2250-hp. passenger unit because of the larger engine. The exciter and auxiliary generator can be used interchangeably on all of these three types of power. The GE-752-C traction motor, gearing and gear cases are all interchangeable among the road switchers, freight and passenger locomotives, and have been increased 23 per cent in tractive effort rating. Older traction motors may be modernized and built up to these ratings by application of new windings; using the old frames, armature cores and

**Locomotive and Car Equipment Dept., General Electric Company*

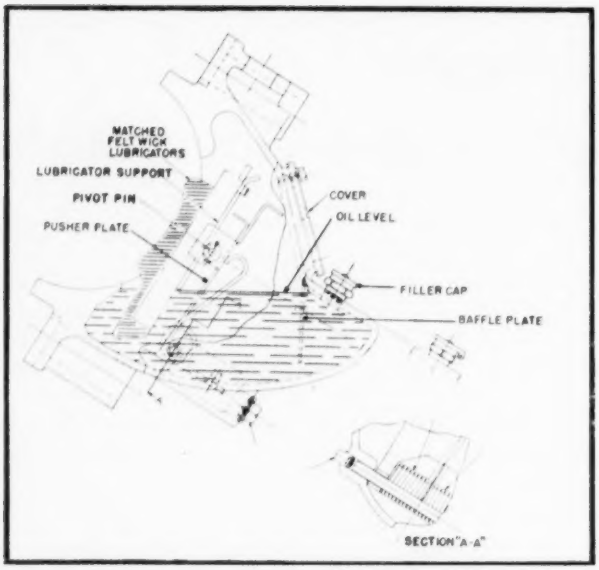


Fig. 2—Sectional view of axle cap with felt-wick lubrication.

commutators, which are all non-expendable parts. The radiator fan gear box and eddy current clutch on these units are also of uniform design.

The designer can learn the needs for improvement in design from the maintainer; and the maintainer, in turn, can get better performance from his locomotives by understanding the equipment. This understanding involves not only knowing "how", but also "why". The manufacturer's instructions are for general use in all parts of the country. Individual roads may require some special adjustments of these to meet their particular requirements. Some modifications can be made with confidence by the individual road when the "why" as well as the "how" of the manufacturer's instructions is understood.

The rotating electric machinery of the diesel-electric locomotive consists principally of the main generator, which converts the mechanical power developed by the engine into electrical power, the necessary control apparatus, and the traction motors, which convert the electrical power back into mechanical power for turning the driving wheels. Additional electric equipment includes the auxiliary generator, the exciter and the cooling fans. The generator and traction motors act as the transmission, applying the diesel engine power to the rails, which results in draw-bar pull at the locomotive coupler.

The generator and motors are essentially alike. Both have rotating armatures and stationary frames. The bearings support the armature in the proper position in the frame. The brushes and commutator enable the electricity to get into and out of the moving armature windings. Other wires carry the current to the field windings on the frame. Such a machine will act either as a generator or a motor, depending upon the conditions under which it is operating. When acting as a generator, power must be fed into the machine by means of a coupling, pulley or gear. When acting as a motor, power must be taken from the armature shaft. In this case a pinion gear is usually used.

Lubrication

Lubrication is a first consideration in the maintenance of rotating parts in locomotive equipment. Oil is used to separate the moving parts of sleeve, ball, or roller bearings, and also of gear teeth. The traction motor suspension bearing—of the sleeve type—supports the motor weight and takes the gear reaction. It is oiled by a most primitive but simple and effective means: a wick, usually of twisted wool strands or of felt. In either case the oil rises in the wick by capillary attraction, not through the fibers but through the small spaces between them. The smaller these spaces the higher the oil will be lifted. The wool waste wick requires knowledge and skill in preparation and application. The fibers must be twisted and packed compactly enough to insure that the oil will rise in the spaces between the strands to the bearing. The lower end of the wick must be secured so that the rotating journal will not drag it up out of the oil. The upper part must be secured expertly so that when the journal rotates the other way the wick will not pull down. The felt wick is more uniform and of the correct compactness. It comes ready for application, which is easy and simple. It is generally considered the better because it requires less skill and is more likely to give satisfactory service.

Suspension bearing lubrication is affected by several other things. The amount of oil fed to the journal varies with oil viscosity and temperature. Light oils feed faster than heavy oils. Accumulation of water in the oil reservoir, from condensation or open filler pipes, will cause trouble. The dip-stick reading may indicate plenty of oil, when actually only a thin layer is floating on top of the water. Any caustic solution remaining in the axle cap after cleaning may attack the wick material, causing damage. Sludge or tarry residue from oils may clog wicks and stop lubrication.

Although axle caps may be interchangeable when new, it is good practice to keep them in the same position as first applied. To insure this, motor serial numbers are stamped on the caps. Thus as they wear or sustain damage, they will remain with the worn or damaged frame, so that when repaired they will again properly clamp the linings.

On Alco-GE locomotives, both oil and grease are used on roller bearings, according to which does the best job on a particular part. Oil is undoubtedly the best lubrication for roller bearings, except for some practical considerations.

Armature bearings at one time were sleeve bearings and were oil lubricated. Most traction motor armature shafts today have either ball or roller bearings. Proper lubrication of these bearings is exceedingly important, as they are heavily loaded and rotate at

high speeds. Space for bearings in traction motors is too small for a sufficiently large oil chamber, hence the oil must be replenished frequently. Hazards exist of oil leaks from pipe plugs and gaskets, also by surging and foaming through the overflow drains. A series of failures of oil-lubricated roller bearings on traction motors led to conversion to grease lubrication.

With grease lubrication there were still troubles and failures, some because of over and under greasing. The necessity of periodically adding the correct amount of grease required maintaining records and schedules for lubrication based on mileage or time. This all became more difficult and involved as the number of diesel-electric locomotives increased. Attention was then turned to the application of a grease developed during World War II, for use on military equipment operating at high temperatures. After extensive experiments in the laboratory and considerable testing on locomotives in service, this grease was put into production. Today motors of Alco-GE locomotives are "sealed lubricated" and run from overhaul to overhaul without lubrication attention. Details of the pinion and commutator bearings are shown in Fig. 3. It has been learned that a departture from specification, or the adding or mixing of other greases is an invitation for trouble. This is given just as a warning to anyone contemplating such action. Undoubtedly this "sealed lubrication" has been a definite contribution to lower maintenance costs on railroads. This advance could not have been possible without railroad cooperation, and the part they played in conducting development tests.

Listening to traction motors bearings at every opportunity is an excellent precaution. A stethescope, a listening rod (there are several on the market), or just a plain steel rod may be used. If everything sounds right, the bearing may be permitted to continue in service. Such examinations may be made at the time of wheel changes, or at other suitable opportunities. The motor may be run light by exciting the field winding from a source of high current power and then applying high voltage to the armature from a

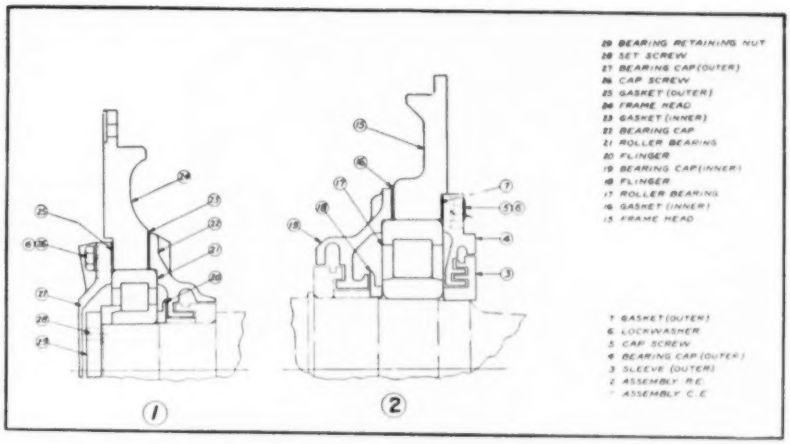


Fig. 3—Sectional view of traction motor armature bearing and frame head. (1) Commutator end. (2) Pinion end.

second source. This also offers an opportunity to give the motor a full voltage test while running for bearing check.

The pinion end armature bearing of a traction motor is larger, (Part 2, Fig. 3), because it carries the heavier load. Today we use a bearing having 20 per cent more capacity than formerly. Numbers 1, 2, 3, and 4 are put on the outer race at 90 deg. intervals. At the first overhaul, it is recommended that the outer race be reapplied in its stationary position with the figure 2 in the original number 1 position. Similar shifts to 3 and 4 positions can be made at successive overhauls. This brings a new section of steel into the heaviest load position of the bearing each time. Bearings which have run 250,000 miles without trouble and show no defects, should be returned to service after inspection by trained men. If such men are not available on the railroad, the bearing manufacturers offer that service. Care should be exercised in packing bearings for shipment. Do not put the inner race inside the roller assembly and outer race. This may result in flat spots being worn in these finely finished surfaces by vibration enroute. Wrap each part separately

Some difficulty has been experienced with commutator end bearings because of the retaining plug nut on the end of the shaft coming loose. This nut must be kept tight. Provision is made for bolting a spanner wrench to the plug nut, so that sufficient torque may be obtained to pull the nut up properly. The necessary force is applied on the end of the wrench by a sledge or otherwise. Every time the bearing is reassembled, it is good practice to renew the set screws provided to hold the plug nut in place. Be sure the set screws used have hardened points, and tighten them securely. Failures have been traced to set screws with ends so soft that they just mushroomed instead of biting into the shaft.

Gearing

The gearing of motorized trucks is an important maintenance item. The power of the diesel engine is transmitted through the traction motor pinions and gears to the axles of the driving wheels. Gear tooth action is a combined rolling and sliding contact of steel on steel. These surfaces must be separated by a film of oil at all times. Gear cases—originally intended for protection of the gears more than to hold lubricant, which was then a stickly substance applied with a paddle—have been developed to fit tightly and hold lubricants of lighter consistency with less loss. Common practice is to heat gear lubricant in the shipping containers in which it is received, so as to facilitate pouring into gear cases. This should be done slowly, so that the lubricant in the container will not burn on the outside before the middle is fluid. Care should be taken that the temperature of the lubricant does not go much higher than 200° F or it will be damaged.

As gears wear they will develop a step in the profile. This will cause no

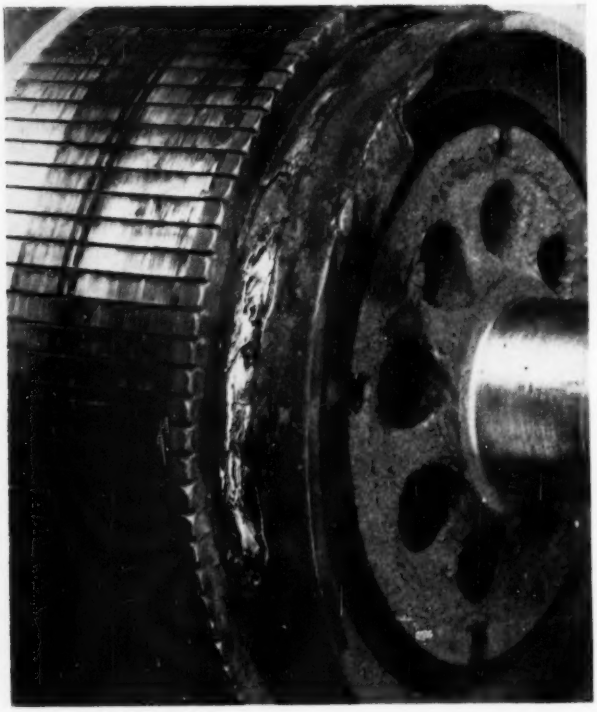


Fig. 4—Damage to generator commutator resulting from overgreasing of the bearing which caused leakage failure of the commutator string band.

trouble as long as the same pinion and gear are used together, and the gear centers are not changed. Trouble starts whenever a worn gear is matched with another worn gear from a different set, or with a new gear. The same thing happens when gear centers are changed by the application of new axle liners. The battering of the teeth of one gear with those of the other goes on until they become worn into agreement. During this period the armature takes a terrific beating from torsional vibrations. Windings begin to shake loose, and the various components and bolted parts in the armature begin to fail. This is how poor lubrication or mismating of gears will show up in increased armature maintenance costs.

Motor Armature Maintenance

Armature banding troubles and some failures have been encountered since locomotives have been geared and operated so as to get maximum tractive effort and speed. In studying this problem, it was rather surprising to find that there is wheel slip during high-speed operation as well as when starting loads at low speed. Locomotives geared to 80 mph. have sustained wheel slip resulting in armature speeds equivalent to 100 mph. Therefore, the width of bands has been increased and triple deck bands applied. It is hoped that, in time, adequate wheel-slip protection will be applied to each motorized axle, not only to control wheel slip, but also to guard against overspeed and locking of the drivers.

The checking of armature banding is important for another reason. Insulation on windings seldom burns out today, but it does wear out from vibration as windings become loose. Tight banding is necessary to keep armature coil insulation from wearing.

Commutators may also develop troubles. One of the worst of these results from stalling. This happens when the throttle is held in such a position that current flows through the traction motors while they are standing still. It is sometimes done to hold the locomotive—perhaps with a train or cut of cars—from moving for a time. When this occurs, heavy current flows through the brush contact positions on the commutator. The particular bars under the brushes become overheated and expand so that they stick up above the adjacent cool bars. When the armature begins to rotate again these high bars cause brush chattering and breakage. Grinders are now available for use in dressing such rough commutator surfaces without removing the motors from the locomotive. The procedure is to jack up the driving wheels to clear the rails and, by applying power to the traction motor from a portable welder, obtain enough speed to grind the commutator smooth. In order to prevent undue wear of the regular motor brushes during grinding, it is advisable to remove them and apply one worn brush in each holder. If commutator bars have been damaged excessively by too much heating, it may be impossible to grind them out smooth; or if ground smooth, they are almost sure to lift again. In that event the armature must be removed for commutator repairs.

Insulation

Generator insulation is the cause of considerable concern to the maintainer. A generator, or other similar electric equipment, necessarily has windings. Insulation confines the flow of current to these windings so that they do their work, very much like a pipe confines the flow of steam to a certain line to an engine. Just as the pipe must be maintained without leaks, so must the insulation on electric wires and coils be maintained in good condition or there will be leaks of electricity. Whenever an insulating surface becomes covered with dirt or other conducting material, electric current begins to leak away from operating parts, grounds occur and troubles are experienced. (See Fig. 4).

Contamination of insulation surfaces results from dust and dirt, oil fumes and vapors all settling in a mixture on the equipment. Some of it also comes from exhaust gases being drawn into the machines with the cooling air. The engine room ventilation system should be arranged to carry these fumes, vapors and gases away from the electric equipment. Operators sometimes block off that portion of the engine room opposite the generator, because of cold air and snow coming in at that point. This causes the generator to draw air from the direction of the engine, with accompanying oil fumes and vapors. The generator exhaust scrolls have dampers so that in the winter the great-

est part of the exhaust air from the generator can be diverted back into the engine room to keep it warmer by drawing in less air from the outside. These dampers may be arranged to exhaust air to the outside in summer.

Cleaning of insulation surfaces that have become contaminated must be done with care to avoid damage to the insulation. Some dirt deposits can be washed off with ordinary solvents, some must be removed by mechanical means. The use of fine abrasive powders, like "Alundum" or "Exolon" in small quantities with a suitable air-blast tool or gun is an excellent means of removing deposits which will not wash off. Too often a dirty surface which has been incompletely or improperly cleaned is painted over. Once dirt has been covered with paint it is almost impossible to clean it, and a high repair bill usually results. If a dirty generator must be kept in service, do as much cleaning as circumstances permit until a really good cleaning job can be done. Do not paint or varnish any surface that is not thoroughly cleaned.

Other cleaning mediums are being tested by some railroads, which is a good thing. It is natural to look for a better way of doing such an important job. Some attempts at speeding up cleaning operations by the use of higher air pressure or heavier abrasive particles have had undesirable results, such as destroying the insulation by cutting through the varnish, fabrics and mica. Some types of heavy particles may not cut the insulation, but they may vibrate the mica layers to such an extent that flakes of mica come loose later in service and disappear, with a loss in insulation. So, in experimenting with better ways of cleaning generators, the results on a long-time basis should be kept in mind.

Generator Maintenance

Generator commutators require some maintenance. Just why some commutors develop raw surfaces after a period of operation is not yet well understood. However, we do know how to control this condition so as to get good operation. The periodic use of a brush seater in front of each row of brushes will keep a commutator operating successfully, without dragging copper between bars to cause a flashover.

Flashovers are traceable to many causes. Wheel slip, carbon and dirt lodged between commutator segments, and circuit or motor troubles all contribute to flashovers. When a maintainer has a flashover report the question is, "Does the generator require attention, or has the flashover been caused by some other part of the locomotive?" It is a simple thing to isolate the generator from the power circuit and bring the engine and generator up to full speed and full no-load voltage. If a flashover occurs the trouble is in the generator. Cleaning the commutator, either by resurfacing or by cleaning out the spaces between the segments is the first step. A process called "air curing" consists of using an air hose and directing a stream of air across the commutator. Signs of a flashover, where dirt is the cause, may be detected by a ring of fire appearing on the commutator as the generator is gradually brought up to voltage. Directing the air stream against the commutator at the points where the ring of fire appears will sometimes blow out the particles of copper, carbon or dirt that are short circuiting the segments. This process should be continued while gradually notching up the throttle until full voltage is reached. Often it is necessary to shut down the generator and try to find the spot in the commutator where the trouble exists, especially on old generators. Frequently, it will be necessary to dig out the defective spot where the mica has become carbonized between segments.

"If there's anything I hate it's something I can't understand."

Blower and Air Duct Considerations

Traction motor blowers became necessary as the power of motors was increased, to force air through the motor and over the windings in sufficient quantities to carry away the heat. Blowers lose up to 30 per cent of their effectiveness when the vanes are clogged up with dirt. Disconnecting the new type of blowers and cleaning out the dirt deposits is a fairly simple job. In a number of cases the accumulation of dirt has been so excessive that the blower motor could not be started, resulting in burned motors and damaged commutators. Evidently, as long as the blower was running, the impeller wheel kept itself free; but when it was shut down, the dirt closed in and congealed enough to lock it.

Air ducts and connections between the blowers and the traction motors require inspection and maintenance. Defective bellows and sliding connections permit loss of air needed for cooling the motors. These defects may also allow oil, water, and abrasive dirt to enter the motor resulting in gummed up brush holders and a scratched or damaged commutator. Such defects are easily detected by purposeful inspection.

Conclusion

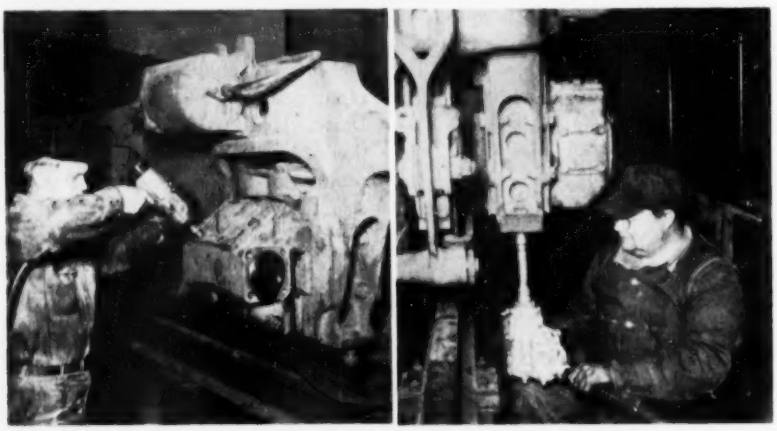
The diesel-electric locomotive is composed of many parts, both mechanical and electrical. When each part is reduced to its components and studied individually, the entire mechanism is more easily understood, and can be handled confidently and effectively.

The diesel-electric locomotive of today is one of the most powerful and expensive pieces of equipment yet to be placed in the hands of railroad men. The care of this equipment is entrusted to the men who operate, service and maintain it. The interest shown in the equipment, and the realization of this trust is exemplified by the organization of Diesel Clubs, and is a tribute to their members.

One Way to Save Money on Repairs

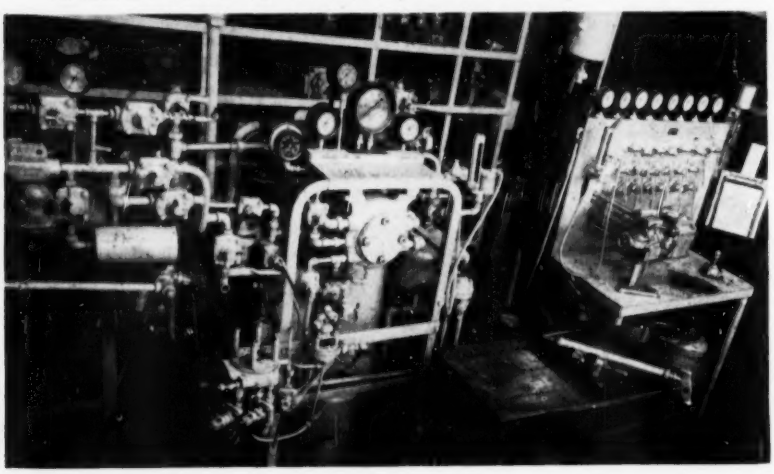
These days, man-hours are frequently a more valuable commodity than money itself. Properly spent for tooling, money will increase productivity, make it easier on the mechanic, and not only pay for itself, but show a profit — a sound investment.

Impactool tightening rocker arm nuts in the Missouri Pacific, Osawatomie, Kansas, diesel shop.



Lighter tool used on inspection cover plate. Tightening binder bolts on EMC-4 diesel truck.

Air room of the Missouri Pacific Railroad shop where all of these pictures were taken.



A RAILROAD shop found that seven hours of hand operation was necessary for removing screws from the side sheets of a diesel locomotive. Direct costs were:

7 x $1.60 per hr. = $11.20

Doing the work with an Impactool (trade name of an Ingersoll-Rand product) took one hour at a cost of $1.60. Thus, the savings was six hours of work and a cost of $10.60. As the tool cost only $200.00, it paid for itself in only 19 hours.

Such cases are by no means isolated ones: Example after example could be cited. A supply of compressed air is the only necessity for these versatile tools to be put to work.

Most shops already have a compressed air supply for various uses and it may only be necessary to extend the piping to the points where the service is required. A check should be made to see that the air supply is adequate and that the pressure is suitable for operating range of the tools.

There is sufficient flexibility to provide great leeway in meeting the requirements of a specific job. For example, take a job where space is a factor, necessitating that tool size be at a minimum and yet comparatively high torque is needed. Selection of the smallest tool with a maximum capacity in the desired range and boosting of air pressure to recommended limits may solve the problem.

Heart of these pneumatic tools is the air motor. Years of development have gone into its design. They are of the vane type with the vanes carried in a hardened steel rotor. The rotor is eccentrically mounted on ball bearings in a cylinder made of a special wear-resisting material.

The inlet and exhaust ports are located so as best to utilize the energy of the compressed air. The special composition vanes are free in the rotor slots and are held against the cylinder by centrifugal force. Thus, a

—Spend It on Pneumatic Tooling

Pneumatic tools of the type pictured here in railroad application have a number of features to recommend them including:

- ✔ Light Weight
- ✔ Compactness
- ✔ Low Upkeep
- ✔ Versatility
- ✔ Dependability
- ✔ Long Life

series of compartments are continually being formed in which the air expends its energy against the vanes, producing rotary motion.

Starting slots allow the air to get behind the vanes to force them against the cylinder until the motor is up to speed, when centrifugal force takes over. Wear rates are kept low by means of a built-in automatic lubricator and by careful materials selection.

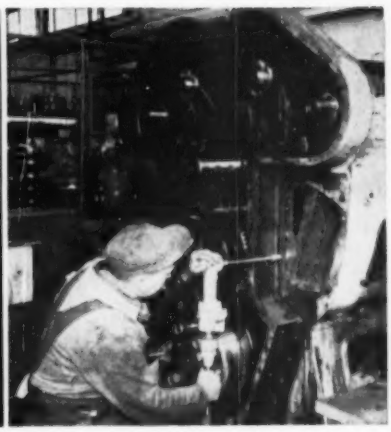
Now comes the problem of adapting the available power to perform certain jobs. In general, the speeds common to air motors are too high for direct applications, except in grinding tools. Reduction gearing is therefore incorporated and ratios selected to suit the purpose.

There are any number of time-saving, labor-aiding applications for air powered tools. These include: Lightweight drills that may be adapted for reaming and tapping operations; chipping hammers; screw drivers and stud drivers; and various nut running applications.

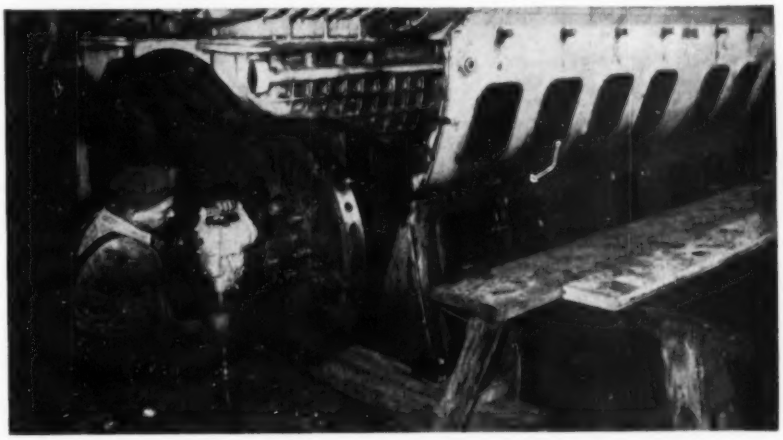
The Impactool is one version of the latter with wide application in the diesel field. The impact unit is a mechanism that converts torque from the air motor into hundreds of "rotary impacts" per minute. The intermittant action of the impact unit virtually eliminates sudden shocks or constant strains at the power end of the tool. Freedom from torque reaction reduces operator fatigue. Never-the-less, powerful wrenching action is obtained and the various sized tools will handle nuts from ¼-in. to 4-in. thread size.

Aside from the more immediate advantages already mentioned, air tools have an incidental but valuable feature. Their simplicity and ruggedness keeps tool maintenance costs to a minimum, but when repairs are necessary they can be very simply performed by any good mechanic in the shop. Entirely mechanical in nature, their repair presents no problem.

Removing Phillips head screws in side sheets.

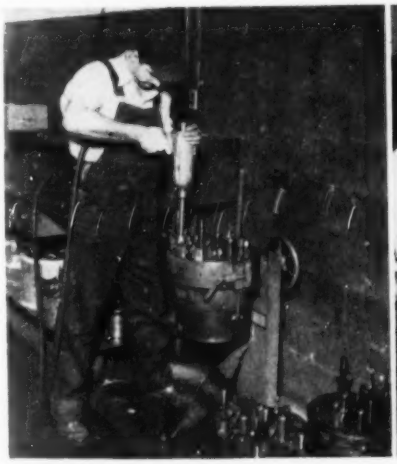


Angle nut runner installing gear case bolts.



Larger tool tightens flywheel nuts. Size range and adapters provide versatility.

Speeding up head overhaul while cutting effort.



Deburring and grinding with high speed tool.

General view of the plating room showing a tank at the rear and one in right foreground. Anodes and shields are assembled to the shaft mounted in the rotating fixture and the unit is ready for immersion in the plating bath.

Hard Chrome Surfacing for Crankshafts

Saving Those Crankshafts—

When a crankshaft is damaged or as they say in the Army, worn through "fair wear and tear", what can be done?

You can—

Grind the damaged surfaces or all surfaces to a standard undersize.

Grind to an undersize, build up the surfaces and then regrind to standard size.

The latter is the most satisfactory in the long run. This and the following article is intended to point out two methods of build-up and to answer such questions as—

What type of facilities are available?

How big a shaft can be handled?

What are the procedures and the equipment involved?

by Richard S. Love

Shop Manager, Koepsell & Love, Salt Lake City, Utah

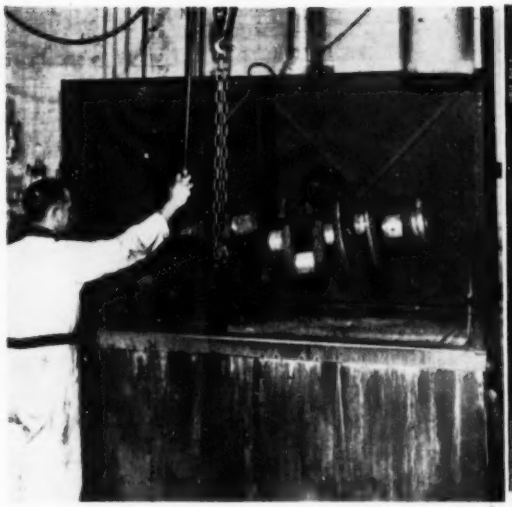
EXPENSIVE crankshafts that are worn or damaged can be reclaimed by the application of a hard chrome coating to the bearing surfaces. In this way the bearing sizes are restored to factory specifications and the necessity for non-standard sizes eliminated. In every respect the refinished shaft is the equivalent of a new one, and in many cases far greater wear resistance is reported due to the finish and hardness of the wearing surfaces.

These results are not achieved by haphazard methods or makeshift equipment, but result from careful control of each step in the reclamation process. In essence the application of the chrome coating is an electrolytic or plating process.

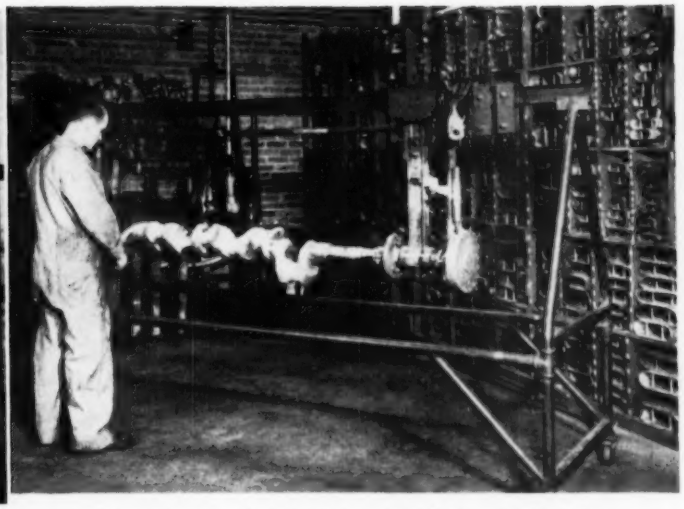
Plating, however, is only one of a number of important steps that must take place and each must be done properly if a good job is to be obtained. Careful attention is good protection both for the shop and for the customer. Equipment, too, is important and to illustrate, the facilities and procedures of Koepsel and Love in Salt Lake City, Utah, will be discussed.

This organization, with long experience in engine repairing and rebuilding, along with other allied activities, has spent considerable time and money in the developing of their chrome plating equipment and other necessary tooling and facilities.

CLEANING is the first step. For best results the shaft must be perfectly clean, oil holes and all. This is done by boiling in a bath containing a strong solution of cleaning compound, sand blasting or both. Once clean, the shaft is ready for pre-grinding after it passes inspection.

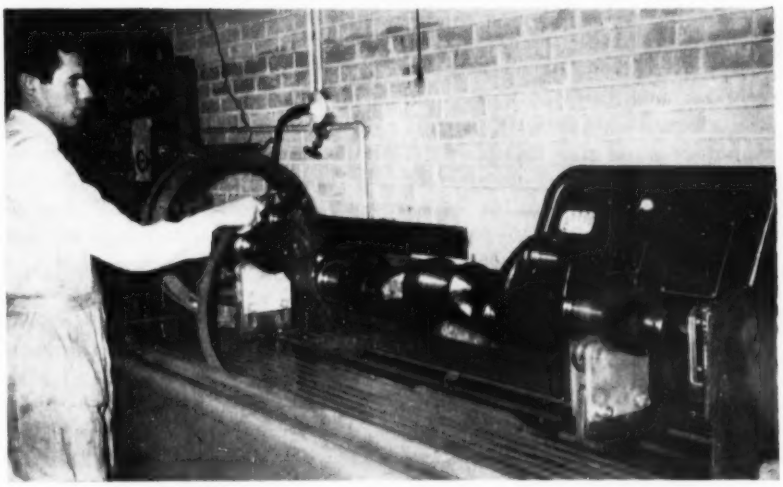


Boiling of the shaft in a strong cleaning solution is the first step in the cleaning process.



Before plating, each shaft is hand cleaned. The special rack is not only convenient for this operation but for assembly of shields, etc., in preparation for and transportation to the plating tank.

MAGNAFLUXING comes next. The very factors that caused the damage or fatigue in the case of wear might have started cracks or defects that while not apparent to the eye could lead to later failure. Rejection of the shaft at this stage saves the useless expense of later work.



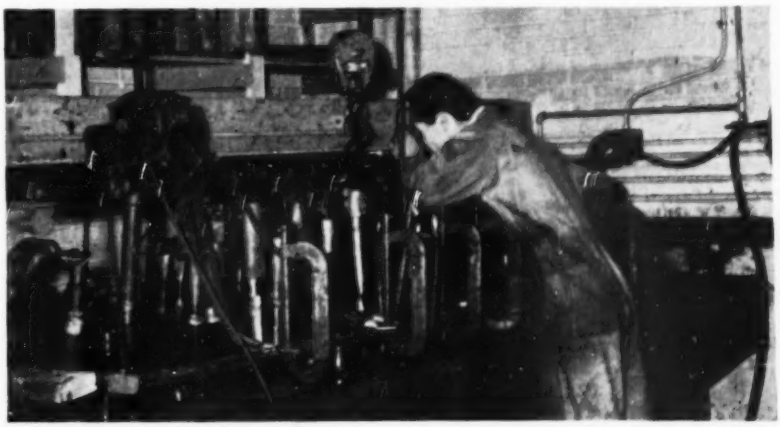
After preliminary cleaning, shafts are Magnafluxed. If the shaft is found to be defective it is junked at this stage and the expense of further and useless work is thereby eliminated.

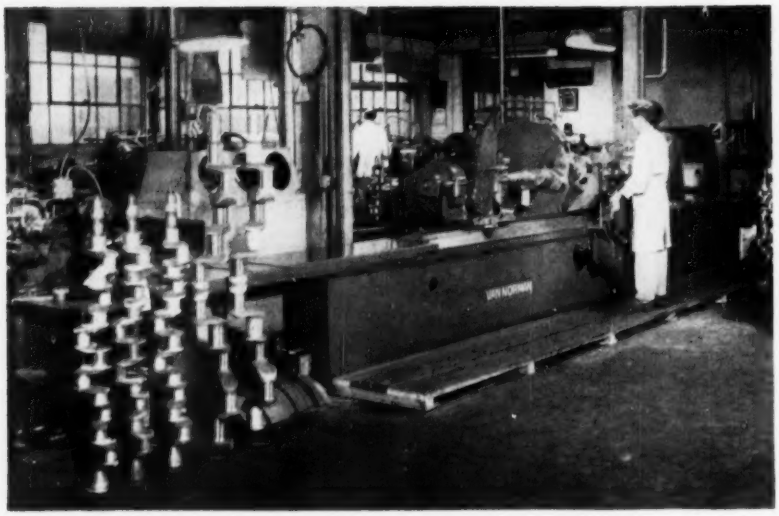
PRE-GRINDING must be done with the same precision as a finish grind. Journals must be round, straight and without taper; fillets must be maintained as in the original shaft. Finish must be good, too. Geometric accuracy is important because the chrome coating should be of uniform thickness for best results. Fillets and finish are important for avoiding points of stress concentration.

Depth of the pre-grind is determined by two factors: (a) the cut required to clean up the surfaces; (b) the permissable maximum stock removal without impairing the strength of the shaft. The latter will vary with the diameter of the journals and has been determined through experience.

The shaft could be used in this condition if under-sized bearings are used. In this case the shaft would be ground to a standard under-size, usually 0.010, 0.020, or 0.030 in., depending on the required depth of grind to clean up. However, the complication of non-standard bearings is introduced and the benefits of the

Checking the progress of the plating operation. Note the electric motor and chain drive for turning the shaft so as to insure an even deposit on all surfaces.





Model VU 420 Climax crankshaft being finish-ground on the large crankshaft grinder. Shafts of up to 112- in. length and 24-in. swing can be ground.

superior wear characteristics of the chrome coating is sacrificed.

After the pre-grind the shaft is again magnafluxed as a precaution. Sub-surface cracks or flaws may be uncovered in the grinding operation.

HARD CHROME SURFACING is the next step. Considerable expense and development was required to produce the plating facilities. It was desired to deposit the chrome in a uniform coat only on the wearing surfaces.

In order to plate evenly, it was found necessary to devise a means of rotating the shaft between the anodes. The optimum shape and size of the latter also had to be determined. Plastic shields were developed to simplify the masking of the portions of the shaft where chrome deposits are not desired.

The resulting coating builds up in the center of the journal slightly faster than near the fillets. Control of build-up is exercised so as to limit the maximum diameter to the point where clean-up at the fillets is assured. This holds subsequent stock removal by grinding to a minimum.

FINAL GRINDING is necessarily a careful precision job. As in the case of the pre-grind, geometrical accuracy is obtained, correct fillets provided and the finish given attention. One point concerning journal diameter is of interest.

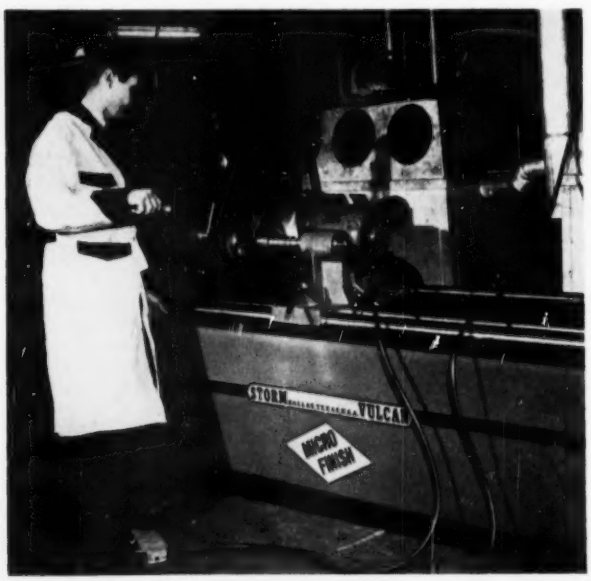
Experience has proven that chrome surfaced shafts require slightly more clearance with respect to the bearing than do the ordinary shafts. This organization has determined the additional increment and makes compensation by grinding the journals undersize by the required amount. Thus, it is possible to use standard precision bearings with assurance that the proper clearance is established.

HEAT TREATING is necessary in the case of most shafts. Facilities are provided to insure, not only that any internal stresses as might be caused by a straightening operation are normalized, but that the original heat treatment specifications of the shaft are met.

There is usually some hand finishing also. An example is the relief at the oil holes.

MICRO FINISHING of the surfaces is the final step. A Storm Vulcan machine is used for this purpose for shafts within its capacity. It can handle lengths up to 90 in. with a 18-in. swing.

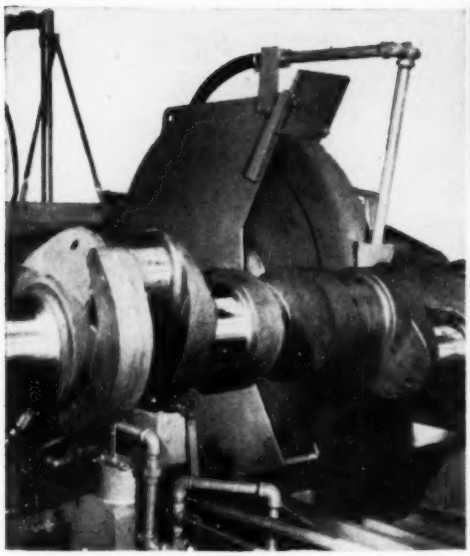
SIZE OF SHAFT that can be handled is limited by the capacity of the largest chankshaft grinder. In this case a Van Norman Model 111 EL is installed and will take shafts up to 112 in. long with a 24-in. swing. Smaller grinders are available and are more convenient for the smaller shafts.



Micro-finishing shafts. Capacity of machine is 90 in. in length and 18-in. swing.

RESULTS of all this work can be seen in the finished shaft, geometrically accurate, of standard size, and with hard, highly polished wearing surfaces. Hardness is equal to 600 to 630 Brinell or so hard that it cannot be filed with an ordinary mill file.

New shaft specifications with wearing surfaces that have shown as high as double the life of original finishes can all be had for considerably less than the cost of a new—and sometimes hard to get—crankshaft.



Regrinding and Metallizing Crankshafts

Emergency repairs and expedients applied to damaged crankshafts will frequently keep an engine running for a while and are valuable, particularly in cases of emergency. They are not, however, to be compared, from the point of view of service life and general satisfaction, to a complete crankshaft reclamation.

Damage to a single crank of an otherwise good shaft may justify repair to that crank alone, but to avoid use of a non-standard bearing, it should be built up to the original diameter. If wear is general, it is also better to restore the original dimensions on all bearing surfaces so as to avoid any future confusion during overhaul with respect to the undersized bearings required.

One method of building up undersized journals that is proving itself in service is the application of spray metal, or metallizing. Many thousands of crankshafts in daily use are attesting to the fact that the process is practical from both the service life and the cost points of view.

Like in all worthwhile processes the success of the finished job is dependent upon the know-how and care applied during each phase of the operation. The scope of application, here a matter of size, is limited by the capacity of the equipment necessary for the job.

Brodie System, of Brooklyn, combines both of these factors to an outstanding degree. Metallizing has been one of their specialties for a number of years and their installation of a new and large model Lempco crankshaft grinder enables them to handle shafts up to 216 in. in length with a 40-in. swing. This is believed to be the largest crankshaft grinder to be found in any job shop.

Availability of this service means that a lot of the larger shafts that were discarded or repaired by expedients can now be given a new lease on life. Probably more important than the cost savings as compared to the price of a new shaft is the lead time required to obtain the new shaft. This is "down-time" to the owner of the engine.

CLEANING is all important to the process of metallizing. Not only is the overall shaft cleanliness important but special precautions must be taken in the preparation of the surface to be metallized.

UNDERCUTTING of the damaged or worn surface is necessary to obtain a coating of uniform thickness and for preparation of the bonding area. This job is done in a large lathe with care taken to maintain the concentricity of the surfaces with respect to the centerlines and to hold the same spacing between the centerlines of the mains and throws.

The metallizing bond is a mechanical one and so a coarse thread is turned in the surface area. The surface is further roughened by a fuse bonding machine that is essentially a low amperage welder. During all of these processes no coolant or cutting fluid is used, in fact, even the hands are kept away from the bright exposed metal. Grease, dirt and oxidation products are natural enemies to a good bond.

METALLIZING takes place immediately after the undercutting process. Spray Bond is first applied in the fillet area because it has been found that it helps to blend in the surfacing material in this critical location.

A specially alloyed material is sprayed on the wearing surfaces. Due to the characteristic porous structure of the spray metal, which incidentally provides innumerable pockets for the retention of lubricating oil, it is not possible to get a true Brinell hardness reading. It is significant, however, that the coating is not freely machinable even with carbide-tipped

Shafts mounted in two of six long-bed lathes that can be used for undercutting, preparation of the bond surface, and metallizing. Completed shaft in foreground is being given a final dimensional check.

tools and requires grinding. This hardness, plus the promotion of better lubrication, creates an excellent wearing surface.

GRINDING of the wearing surfaces restores them to original dimensions. This work is now done in the new crankshaft grinder the design features of which permit the handling of a wide variety of shafts with facility and accuracy of the results obtained.

This being one of the first of this model grinder to be placed in operation a description of some of its features are felt to be of interest.

DESIGN FEATURES OF THE GRINDER include a wide degree of flexibility in mounting shafts since in this type of work a variety of types, particularly with respect to flanges, gear sprockets, extensions, etc., are encountered. Turning speeds and counter balancing of eccentric masses must also be considered.

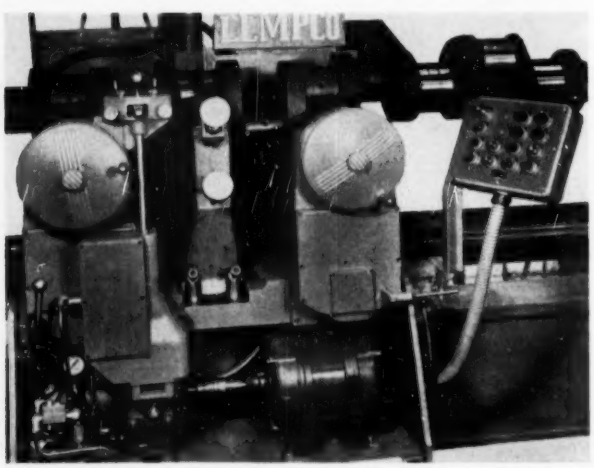
Shafts may be mounted on centers or mounted in the pot chucks. The latter are of interesting design and in addition to being a holding device, tie in with the counterbalancing features.

One side of the very heavy pot chucks is open to accommodate shaft flanges up to 18 in. in diameter. Shafts up to 10 in. diameter and with extensions up to 20 in. can be clamped. Set screw controlled wedge jaws clamp the shaft at a point closer to the work area than is the case with more conventional chucks.

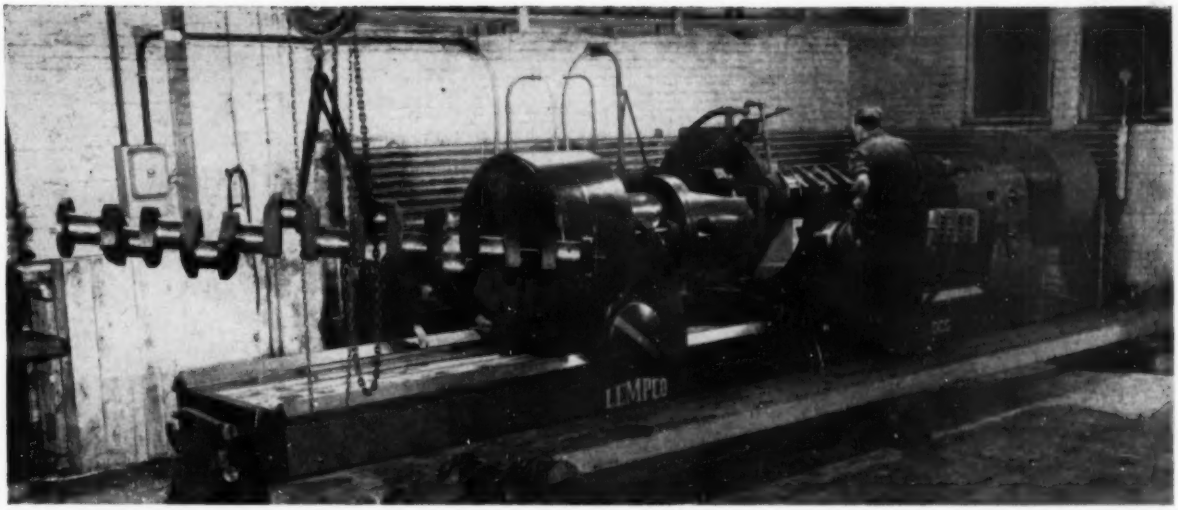
If centers are to be used, a special centering device is clamped in the pot chuck. This reduces the length of shaft that can be handled in this manner to 178 in. Maximum capacity between faceplates is 224 in. Maximum swing over the wheel slide is 40 in. and the grinding radius with a 46-in. wheel is 20 in.

Shafts are offset for grinding connecting rod throws by the use of calibrated blocks placed in the throat of the pot chuck with final micrometer adjustments accomplished by movement of opposed sliding wedges. It should be noted that the weight of the heavy chuck remains in the same location and tends to oppose the unbalance caused by the offset of the shaft. This is contrary to the effect obtained in conventional throw heads where a good portion of the chuck weight moves outward with and adds to the unbalanced mass of the shaft. This weight must be compensated and frequently size and weight of the counterbalancing mass becomes a problem.

On this grinder, counterbalancing has been greatly simplified. Permanent weights are mounted on the outboard end of both the head and tail stock. A lead screw arrangement provides for lateral movement. The effect of movement of the weights is



Control station of the grinder showing control and alarm panel, wheel slide controls and steady rest.



The machine at work. Housings at both ends enclose the counter-weight mechanism. Offset scale is visible through center slot. Pot chuck is seen at head stock with bridge clamp holding the shaft flange.

shown on a calibrated scale. Setting is accomplished by application of a simple formula: W x R = setting. "W" is the shaft weight and "R" the throw.

Location of the counterweights away from the clamping location places the node of zero deflection in the bearing area rather than in the work area as is the case when all the weight is concentrated at the throw head.

The weight of the pot chuck aids in the balancing the overhanging counter weights and creates a better spindle bearing loading condition.

All of these factors affect either the facility of operation or the final finish of the grind. Deflection or vibration is bound to cause chatter or inaccurate surfacing. Work turning speed is another factor affecting finish and this particular model is provided with a drive that is infinitely variable from 10 to 70 rpm.

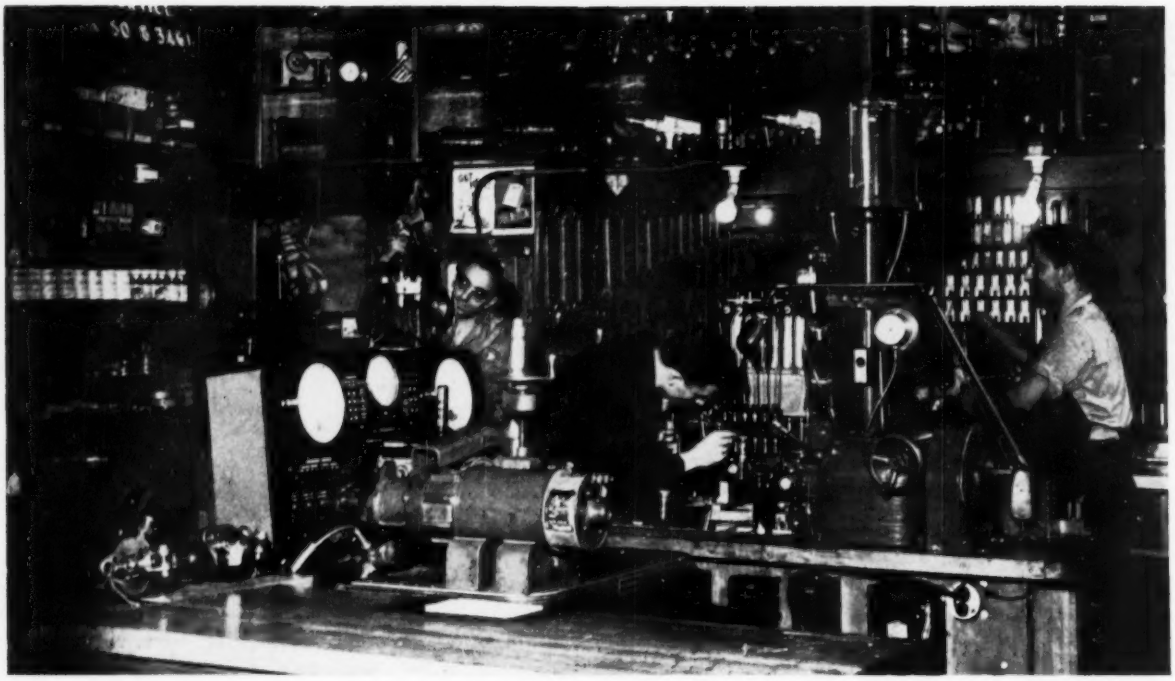
The tail stock is stationary but the headstock is easily movable to adjust for varous shaft lengths. The wheel slide meves along the full length of the ways and the wheel head is retractable to permit movement of the slide to the next work location while the shaft is mounted. Both wheel slide and head are moved by a hydraulic system providing infinitely variable and accurately controlled speeds.

Every provision is made for rapid and positive control during the grinding operation. Safety features are included even to the point of a device to shut down the machine in the event of an over-heated bearing.

SERVICE FACILITIES for the reclamation of the larger shafts will render a valuable service to diesel owners over a wide area. Brodie has been doing such repairs on a somewhat limited scale using an ingenious grinder of their own design. However, the accurate work obtained was the result of considerable application of individual skills and much expenditure of time.

The inherent accuracy of the new grinder and the features designed to facilitate all the steps of the grinding process will permit a good job to be done in less time. This will improve production and extend the value of this service.

Headstock drive and counterweight mechanism. Spindle speed is controllable between 10 and 70 rpm. Counterweight movement is effected by lead screw shown.



One side of the compact shop. At right is one calibration stand, the larger for the individual type pumps not being shown. The tester at the left is for starters, generators and voltage regulators. Note the neat tool board in background and the well stocked shelves.

Are You Sure It's Your Injection

THE phone rings. An irate voice hollers, "What did you do to this injection equipment? The engine runs worse now than it did before you fixed the pump. Come get it and fix it right this time." Oh boy, another one.

Such calls are not infrequent in any injection shop, but this one happened to come to Bill Featherstone in the A & D Diesel Service in Brooklyn. He passes the word to Jim D'Aversa who, though a proprietor, might have done the job himself. Jim gets down to the scene of trouble and let's see what happens.

"What seems to be the trouble?", Jim asks.

"The engine runs ragged. We have checked everything and can't seem to do any good. You must have slipped up in the pump somewhere."

Jim proceeds to ask the usual questions and gets the usual positive answers that everything has been checked and the engine is just as it was before the pump was sent for calibration and repair. Somewhat of a cynic, resulting from bitter experience, Jim checks the timing, the fuel system, the hookup of the pump and finds them to be all right. Hmm—maybe they did slip up somewhere on the pump. Giving it one last try, Jim asks a very pointed question, "Did you do anything to the engine?"

He gets a reluctant answer, "Well, we did pull the pistons and change the rings." Jim dives for his tool box and comes up with a compression tester. Cylinder pressures are found to be all over the lot with one 75 psi. below normal for the particular model engine.

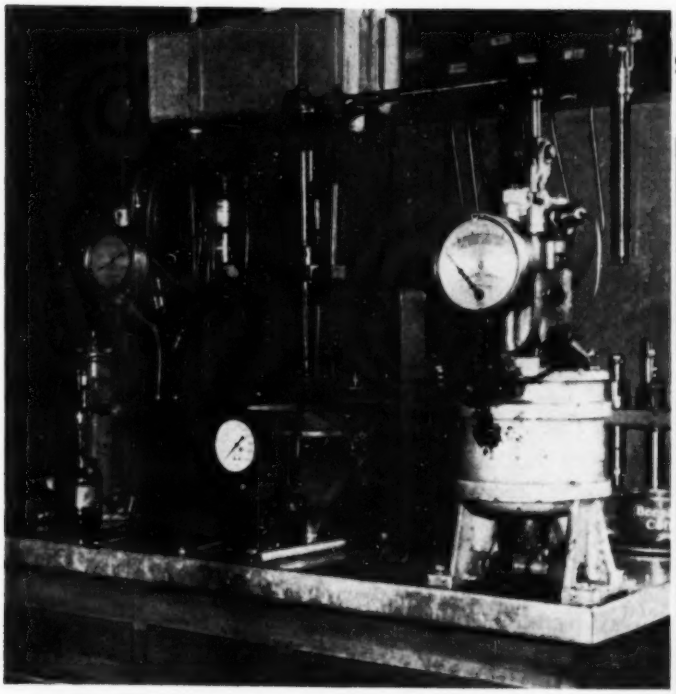
At this point, the red-faced owner allows as how perhaps it might be a good idea to wait until the piston rings seat, that perhaps the liners were pretty badly worn and that the pump and nozzles may be all right, after all.

If you should think that this is far fetched, you should hear some of the stories that Jim can tell of actual service calls. Improper timing when the pumps are installed on the engine is a very common source of calls. Engines do not run very well when timed to inject at the bottom of a stroke.

Then there is the time that the sailing of a ship was delayed because an overhauled auxiliary engine with a newly calibrated pump would not start. The pump, of course, was blamed, but the engine was started by the simple expedient of putting a few squirts of heavy engine oil in the cylinders to seal compression.

Now don't get the idea that everyone in the business of repairing injection equipment is infallible: Far from it. Knowledge, careful workmanship and good equipment are the ingredients necessary for a top-flight job on injection equipment and even then some boners are pulled. When you have all three, however, the odds are generally in your favor.

Jim learned his business in manufacturers' schools and the hard as well as possibly the best way, experience. One of the first things he learned was the absolute necessity for



The nozzle testing bench. Included with the conventional testers are one for checking common rail type pumps and nozzles and the Fairbanks, Morse tester at right.

Touching up a lapping arbor in preparation for dressing a nozzle seat. Special grinding attachment is also used.

Equipment?

cleanliness when working on this type of equipment. A thorough cleaning of the disassembled equipment is the first step and the same standard is maintained throughout the operation.

When it comes to calibration of pumps there are two test stands, one for the *en bloc* type of pump and another for the individual type. There is also a special stand for testing Cummins pumps, and one for checking common rail pumps and injectors.

Speaking of injectors, there are popping testers for setting nozzle opening pressures and all the special devices used for testing leakage at lapped fits, check valves as in Cummins injectors, leakage by the nozzle needles and at other locations.

Nozzle seats are lapped in a special lapping lathe equipped with a small grinder. The latter makes it possible to grind the proper angle on the cast iron lapping arbors that are used to dress the seats. If the needle could do with a refacing, this can be done too.

All the necessary equipment is there backed by a sizable stock of parts and exchange replacement units; each step of the work is supervised and the tested product is carefully packed and protected from entry of dirt during shipment. Yet, this isn't enough.

"These engine boys are great little buck passers," opined Jim. "Sometimes, the injection equipment is the only part of the engine that they are not supposed to repair, and so, it always takes the rap. In other cases, they just don't know. Then, of course, we have a lot of accounts where we have no trouble at all. In fact, these other things happen just often enough to fully convince me that I have got to be an engine man too.

"After all, neither the engine nor the injection equipment work alone. You have to put them together and make them work. For my own protection, I've had to get the tools together so that I can do a decent trouble shooting job on the engines.

"Another thing that I have learned is not to take anybody's word on what has or has not been checked. A fellow might innocently lead you astray. I always start from scratch and most of the time will find that some simple or even silly little thing that is not related to the injection equipment in any way has been done wrong or has been overlooked completely."

There is a moral in these remarks. An engine is not a subject for jurisdictional disputes. Its parts work together or the engine suffers or quits completely. It doesn't pay to jump to conclusions, in fact, it can be downright expensive.

Analyze your troubles and definitely locate them. If it points to the injection equipment, then is the time to have it fixed. When it comes back, be sure that it is installed properly, bearing in mind that the best injection equipment in the world will not compensate for poor engine condition.

When you are sure of all these things, really for sure, and still the engine does not run right, then yell for the injection man.

Servicing Engines Equipped with Sleeves

by L. W. Kibbey
Sealed Power Corporation

There are two general catagories of sleeved engines—the dry sleeve type and the wet sleeve type. The dry type gets its name because it does not come in contact with the cooling agent. The wet sleeve generally has an area known as the water jacket section, which is always exposed to the coolant.

Wet type sleeves are fitted freely into the motor block but are sealed from combustion by head gasket and from water and oil by synthetic rubber sealing rings located near bottom end of sleeve. Two methods of retaining these seals are currently employed; one where the sleeve is grooved for rings, and the other having grooves cut into the block. From one to three rings are in use today.

Dry type sleeves are used in two forms, with a flange or collar at the top, and the plain straight type. Fitting of dry type sleeves in the engine requires more care and skill, for reasons to be disclosed later. Two distinct methods of fitting are currently in use by engine builders. The original "press" fit is still the most used, but recently there has been a trend toward the "slip fit."

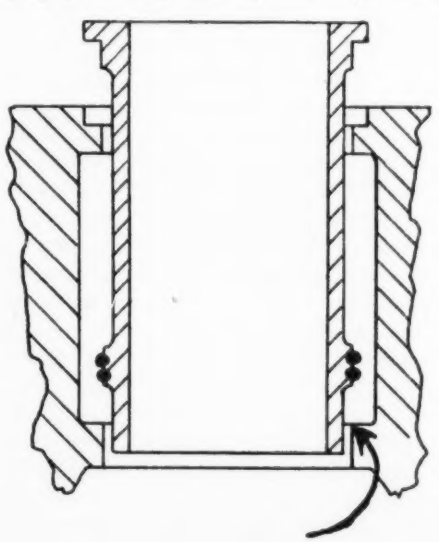
There is a difference between "slip fit" and "slop fit". We know that a metal to metal contact between sleeve and block is needed to insure proper dissipation of heat to the cooling system. If we fail to get this by allowing too much clearance, and do not use a metallic seal, oil or combustion products may work their way between sleeve and block, thereby creating an insulation which will obstruct normal heat passage. Voids filled with seal permit heat to pass through unrestricted.

When an engine reaches the overhaul stage, many operators re-install sleeves without too much checking into the condition of the old ones, particularly if they are the hardened grey iron sleeves which are difficult to rework. Without proper tools, the time spent would not warrant such rework over the cost of the new sleeves. However, if the old sleeves are in fair condition and you have a boring bar made especially for hard material, you may find it profitable to bore and hone for oversize pistons. It is safe to go up to 0.030 over size except on dry sleeves with a wall thickness of 5/64 in. or less.

Installation—Wet Type

1. Old sleeve can be lifted out of place by first tapping from bottom to break the seal.
2. Scrape out all deposits of rust, scale, carbon, etc., from machined areas in block which come in contact with sleeve. Follow up with piece of medium fine emery paper until bare metal is seen—particularly in sealing wet grooves.
3. Round off the top edge of the hole in bottom of block that the sealing rings pass through. This is important, as a rough edge will cut or turn sealing rings which can result in a leaky installation.
4. Try new sleeve in cleaned block, to be sure it fits properly. If everything is right, you should be able to turn the sleeve by hand. Be sure the sleeve flange rises above top of block from 0.002 to 0.007 in. in order to insure a good crush on heat gasket.
5. Having satisfied yourself that the sleeves are correct and fit properly, you are now ready to install with seals. Place sealing rings in block or on sleeve as the case may be, taking care not to overstretch them. The inside of seals should hug the sleeve and not be twisted or cramped.
6. Apply a generous coating of one of the following materials on the seals: hydraulic brake fluid, green soap, potash soap, or lard oil; work the sleeve gently into place as far as possible by hand, then tap lightly on board on top of sleeve to settle in place.
7. Fill block with water and check for leaks before assembling rest of parts.

Fig. 1—Round off shoulder indicated by arrow to prevent tearing or twisting of the seals when the liner is put into place.



Dry Straight Type—Without Flange

This type sleeve is generally used to salvage blocks having cracked or excessively worn cylinders. Because it has no collar to stop movement in cylinder, it is usually installed with an "interference" fit of 0.0005 (½ thousandth) per inch of diameter. Note: If entire block is to be sleeved, do not bore or sleeve each cylinder in succession. To avoid block warpage, start with No. 1 cylinder and do all odd numbers, then come back to No. 2 and complete even numbers. The necessary steps to obtain proper "interference" fit are given here.

1. First find actual O.D. of sleeve in this manner—mike sleeve O.D. in three places at bottom (approximately 120° apart) and three places at top (approximately 120° apart)—add together all size readings and divide by six. This will give you the "mean" O.D. of sleeve from which to figure size of hole to be bored. This should be done after cutting sleeve to same length as block. From this figure subtract 0.005 for each inch of bore size—0.0015 for 3 in. bore, 0.002 for 4 in. bore, etc. As an example, let's say we have a sleeve with actual O.D. of 4.001. Subtract 0.002 and you have 3.999, which is the size of hole necessary for "interference" fit.
2. Centralize boring bar in hole by "cats paws" or other means provided with your bar.
3. Never try getting hole to size with one cut—follow instructions given with your bar. The final cut must not be more than 0.040 in. in diameter in order to end up with a round, straight hole, cut to predetermined size.
4. Round off lower O.D. corner of sleeve and top of block. Cover sleeve with coating of anti-friction oil, hydraulic brake fluid or litharge and glycerine. Start sleeve squarely and draw into place with "sleeve puller" or press in place with "hydraulic press". Installation can also be made by "heating block" or "shrinking sleeve" with dry ice.
5. An alternate method where a "slip fit" can be given—

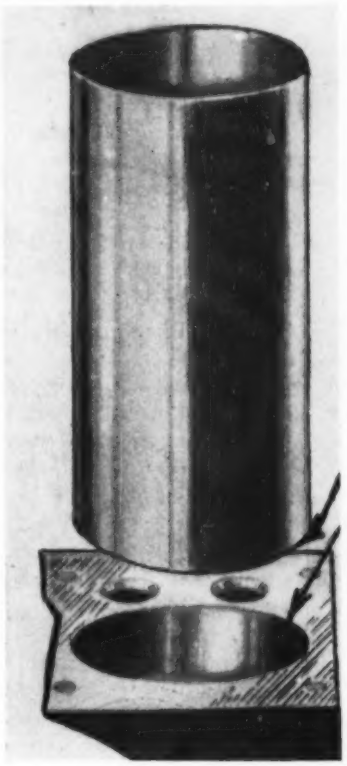


Fig. 2—Right. Round off lower O. D. corner of sleeve and top of block as indicated by arrows to help start liner in block.

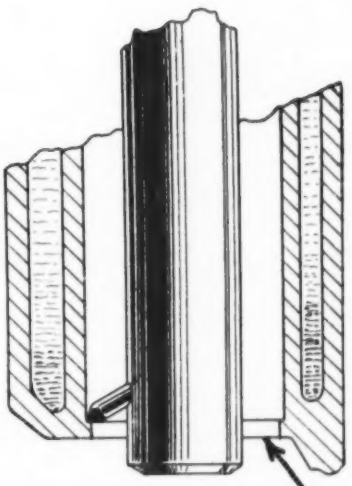


Fig. 3—Right. Turn shoulder indicated on bottom of sleeve to keep sleeve from moving too far into block.

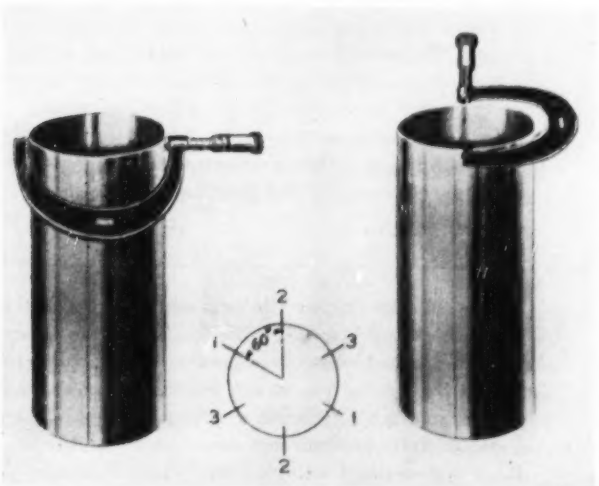
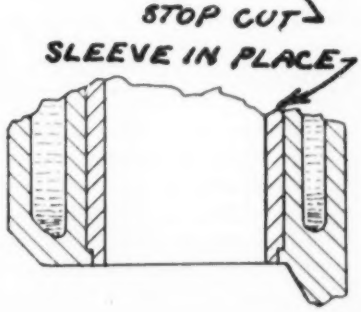


Fig. 4—Left. To determine O. D. of sleeve, mike sleeve top, bottom, and center every 60 degrees as shown.



this type of sleeve is possible with extra work viz:

a. Find "actual" size of sleeve per note No. 1.

b. Bore block per notes 2 and 3 from 0.001 to 0.0015 larger than sleeve O.D.

c. Stop the final bore cut at a point 3/16 from bottom of block.

d. Turn a step on bottom O.D. of sleeve 3/16 long and 0.005 to 0.010 smaller than step in block. This provides a small shoulder to keep sleeve from moving downward.

e. It is advisable to try the fit of each sleeve after honing block. If proper clearance is provided you will be able to push about ½ of sleeve in bore by hand.

f. Round off outside corner of sleeve at step and top of block with a fine file or stone. Clean all grease and oil from sleeve O.D. and block bore with a good solvent such as carbon tetrachloride. Cover entire bore with "metallic seal" or "cylinder sleeve seal" and insert sleeve immediately, wiping additional seal on sleeve as it is pushed in. Tap sleeve with mallet or plastic hammer to settle all the way down. Wipe off all surplus seal from top and bottom of block.

g. Finish hole to size as described under finishing instructions.

Dry Type Liner with Flange-Slip Fit

1. Remove old sleeve with hydraulic or screw type puller.
2. Hone out block with coarse stones from 0.001 to 0.0015 larger than actual sleeve O.D. If distortion is present and large areas in block do not clean up, it is necessary to enlarge block for a sleeve with an oversize O.D.
3. After honing or boring, check clearance by trying sleeve in block. If correct, about ½ of sleeve can be pushed in by hand.
4. Round off lower outside corner of sleeve and top of block with a fine file or stone. Clean all grease and oil from from sleeve O.D. and block bore with a good solvent such as carbon tetrachloride. Cover entire bore with "metallic seal" or "cylinder sleeve seal" and insert sleeve immediately, wiping additional seal on sleeve as it is pushed in. Tap sleeve with mallet or plastic hammer to settle all the way down. Wipe off all surplus seal from top and bottom of block.
5. If block was not originally fitted with flanged sleeves, it will have to be counterbored to receive flange. Bore counterbore diameter 0.005 larger than flange O.D. of sleeve. Mike the width of flange and make depth of counterbore from 0.001 to 0.004 less.
6. It is recognized that methods of installation different than outlined herein are in use today with apparent success. Some prefer fitting sleeve with "interference" while others use more clearance. Theoretically, all sleeves should be fit metal-to-metal to insure combustion heat transfer to the coolant, but experience with slipfit sleeves has been satisfactory enough on the whole to warrant their use, particularly when the seal has been used.

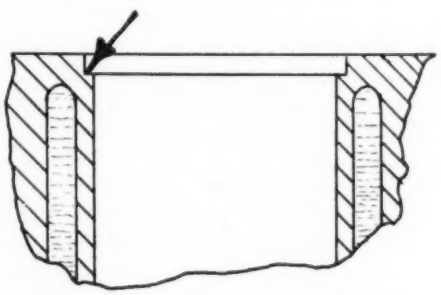


Fig. 5—Machine counterbore in block to receive flange of liner if engine was not originally fitted with flanged sleeves.

Dry Type Liner with Flange-Press Fit

1. Remove old sleeve with hydraulic or screw type puller.
2. Run coarse hone through bore to remove scale, carbon, lacquer, etc. Scrape all deposits from block counterbore so as not to interfere with the entry of flange on new sleeve.
3. Check size of cleaned out hole with actual sleeve O.D. Some of the original interference may be lost by cleaning up bores but do not worry if there still remains at least a line-to-line fit.
4. Round off lower O.D. of sleeve; apply coat of antifriction oil or hydraulic brake fluid. Start sleeve squarly, draw into place with "sleeve puller" or press.
5. It is usually necessary to finish bores of pressed-in sleeves to obtain proper piston clearance. If so, follow procedure given under finishing instructions.

Finishing

1. Bore semi-finished sleeves to within 0.001 to 0.002 in. (one to two thousandths) of finish size desired.
2. Rough hone to within 0.0005 to 0.001 (½ to one thousandths) of finish size. Use a fast and steady up-and-down movement of hone so as to produce stone marks with a well defined diamond shaped pattern. Expand stones gradually—don't use excessive pressure, as you are apt to rupture the granular structure of the surface metal. When stones "squeal" excessively they are either glazed or too hard for the job. Glaze can be broken by moving the stones up and down in bore without rotating if sufficient pressure is applied. Score marks in finish indicate that stones have loaded spots. Remove these by dressing off with another stone.

3. Change stones and finish hone to final size.
4. Final finish should have a dull grey color with rough honed diamond shaped pattern still visible.
5. If your hone is one designed to be operated *dry*, follow instructions given by manufacturer. For wet hones and honing lubricants see accompanying table.
6. After finish honing, check piston in bore with feeler to be sure you have recommended clearance.
7. Cleaning

   a. Wrap a piece of wet-or-dry paper (320-400 grit) around stone, dip in light oil and run up and down the bore 15 to 20 times with hone expanded to touch gently while rotating. This will pick up the greater portion of abrasive particles and metal fragments. Crocus cloth will also be satisfactory.

   b. Use stiff bristle brush and scrub bore vigorously with heavy solution of ordinary soap suds. Rinse off with clear water.

   c. Hold a copper penny against cylinder wall with forefinger and slide it up and down several times. If the edge of penny is cut easily, it means the finish is too sharp and will injure the piston rings. Run paper or crocus cloth through bores again until this sharpness is removed.

   d. Apply generous coat of heavy motor oil to bore and wipe out well with soft paper toweling or paper handkerchief.

Stones and Lubricants Suggested for Wet Honing

Roughing Stones

1. Unhardened Sleeves and Blocks: C150 JV or KV; C180 JV or KV
2. Hardened Sleeves: C100 JV or KV; C120 JV or KV.

Finishing Stones Suggested for Wet Honing.

1. Unhardened Sleeves and Blocks: C320 IV of JV; C400 IV or JV.
2. Hardened Sleeves: C180 HV or IV; C220 HV or IV.

Legend for Stones: C-silicon carbide; numbers-size of grit; letters (except V) hardness: V-vitrified bond.

Lubricants Suggested for Wet Honing

Kerosene or mineral seal oils are satisfactory; however, most oil companies sell a "honing compound" which can be blended with either and should be used for best results.

Parts Assembly and Run In

1. Check piston clearance at sealing ring section of sleeve to make sure you have the amount recommended, as improper assembly of sealing rings can cause sleeve distortion and loss of clearance.
2. New sleeve assemblies alone are not always the only requirement to bring the engine back to top performance. Worn valve seats, valve guides or bearings and weak valve springs, poor carburetion, etc., will all lessen the performance and should be taken care of at the same time.
3. When assembling set screw type pins you must line up the hole in pin with the hole in piston before starting screw. Forcing line-up by turning screw will stress the piston material and probably crack it.
4. Where the rod is clamped over pin, it is extremely important to tighten bolt carefully so as not to distort piston pin. Follow carefully the amount of torque pounds specified by the engine builder, if available. If not, use ordinary open end or socket wrench without extensions, such as a piece of pipe. Plenty of pressure can be applied with the wrench alone. It is good practice to check pin fit in piston to see whether you have affected it by tightening the bolt. If fit has tightened any, it's a good sign you have tightened bolt more than necessary and should back it off a trifle. A distorted pin will gall in the piston causing piston to seize in cylinder.
5. Try each ring in bore before assembling on piston to determine ring gap. Some rings have "top and bottom" sides and must be installed with proper side up to obtain the desired performance. Use ring compressor to close rings for easy installation and insurance against breakage.
6. Cover all rings and piston skirts with a high grade light oil to provide lubrication until oil pump starts circulation and spreads a film of oil on cylinders.
7. The final phase of the assembly and one of the most important is the manner in which the cylinder head studs are drawn down. An otherwise perfect job can be ruined by unequal or too much torque on the nuts. Follow engine builder's specifications for torque pounds and proper sequence in the tightening operation. If not available, common practice for tightening sequence is to start at the center studs and progress outward, skipping back and forth from one side to the other, until all are down. For general use, the following number of pounds will suffice, if you do not have original specifications.

3/8 bolt	25 to 30 ft. lbs.
7/16 bolt	50 to 55 ft. lbs.
1/2 bolt	80 to 85 ft. lbs.
9/16 bolt	110 to 120 ft. lbs.
5/8 bolt	140 to 150 ft. lbs.
11/16 bolt	170 to 180 ft. lbs.

8. After the engine has been closed up and thoroughly checked for proper ignition, timing, carburetion, etc., fill crankcase with a good grade non-compounded light oil. Run engine for two or three hours at a speed sufficient to keep the oil pressure at normal. Do not idle during break-in as parts of the engine may fail due to lack of oil. Increase speed gradually to allow proper wear-in of new parts. Drain oil after break-in and fill crankcase with fresh oil.
9. Do not keep water running through cooling system during break-in. Fill up radiator and allow engine to reach its normal operating temperature.
10. Oil cleaner and air cleaner should be serviced after the engine overhaul to assure maximum cleanliness and avoid injury to the new parts.

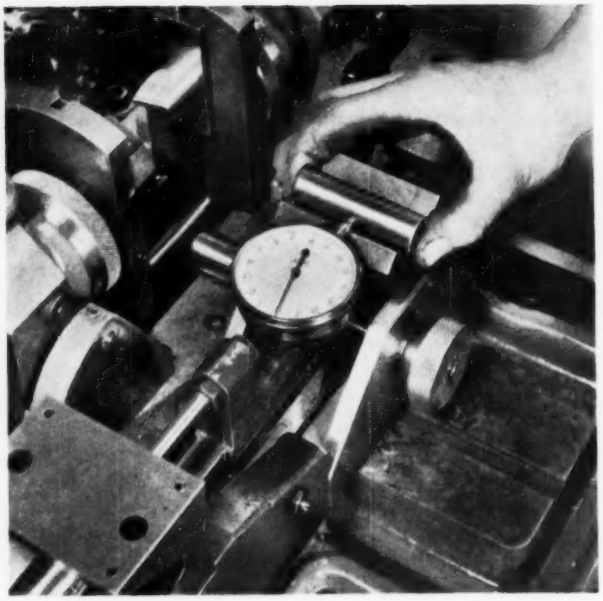
Pin Fitting by Comparison

For piston pin fits that are acceptable for modern engines, care and consideration must be given to:

- Finish of the bearing surfaces.
- Proper clearance and tolerance.
- Center-to-center distance of the rod ends.

Features of a machine that will adequately and rapidly fill the above requirements with a minimum of skill on the part of the operator are described including use of a:

- Damped quill boring bar.
- Comparative method of pin fitting.



Adjusting the tool setting indicator. Master pin is set in vee-block on table, checked for diameter variations, any difference split, and the dial indicator set to "zero".

WITH the modern high speed, high output engines that we have today, matching and fitting methods that were practiced twenty years ago are no longer acceptable.

In the good old days, wrist pins were fitted by the use of straight fluted line reamers. Force fits were used because high spots from reamer chatter were common. Either such spots were hand scraped or allowed to wear in. Excessive clearance developed after a short time making refitting necessary.

Introduction of the spiral bladed reamer was a great improvement, but this method also necessitated setting the pin with a slight drag and gave excessive clearance after breaking in.

A more modern approach to the problem was the use of hones. This method, while a distinct improvement, required setting the stones before the rod or piston could be honed and sometimes caused bellmouthing. Satisfaction was achieved on long bearing surfaces, but much difficulty was experienced with the shorter types.

Improvement of the honing method by expansion of the stones during the process corrected this difficulty. Bellmouthing was eliminated and the surface, while superior to reaming, was still fairly rough. Pins were still fitted with a push fit.

During World War II, wet honing was developed and found to be a more accurate method of sizing and finishing internal holes. With the superior finishes that could be produced with new stones of finer grade and the surface accuracy achieved, positive oil film clearances could be established and the pins fitted without drag. With proper lubrication, service life was more than double that of the earlier tight fits with inaccurate surfaces.

This background serves to prove that good surface finish and accuracy permits clearance fits with improved service life, an idea that has been hard to get across. Honing, however, is not necessarily the answer, since the process is subject to some limitations. Hones follow the hole and so a boring process is frequently necessary to properly locate the hole center.

Precision boring tools are now available that can produce the necessary finishes and fits while at the same time locating the holes accurately. Such a machine is the Van Norman "Pin Shop" in which a number of interesting features are incorporated to enable the job to be done with accuracy and facility.

General Description

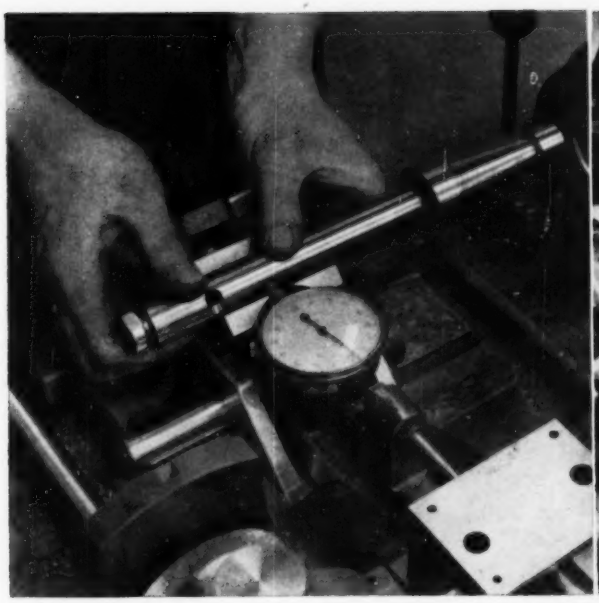
The machine consists of a rigid bed with accurately fitted and hand scraped ways; a boring head with a spindle mounted in precision type ball bearings; and a traversing table. The work is mounted on the table in a special "vise" or on a "knee" and the table traversed to move the work relative to the boring bar mounted in the spindle.

It was designed and built to perform a complete service for connecting rod and piston assemblies, boring the crank end of the rod as well as the wrist pin eye. However, for the purposes of this article, only those functions dealing with the fitting of piston pins will be emphasized.

Piston pin holes of up to 2⅜ in. can be bored in both pistons and rods. The holding fixture will accommodate pistons up to 6 in. diameter and 9 in. length. The knee will mount rods up to 16 in. in length.

Comparison Fitting Feature

Those familiar with conventional methods of fitting will appreciate the simplicity and accuracy with which fits are made on this machine. The possibility of errors in "miking" are eliminated. "Miking" of the pin, measurement of the bore and miking of the indicator are all steps that can introduce error, particularly when the clearances are in tenths of a thousandth.



A 1-in. boring bar is similarly checked. Pin is set in vee-block, bar in spindle and indcator set to "zero' allowng for differences in diameter. This sets the reference distance.

Once indicator is adjusted, pin to be fitted is placed in vee-block. When tool is adjusted as shown to "zero" reading, hole bored is exact size of pin. Clearance can be added

Here, the cutter is set to bore the proper size hole with the actual pin to be fitted as a guide. A tool-setting dial indicator, a 60-deg. vee-block and a pin contacting shaft are the elements involved. Once properly adjusted, the cutter can then be quickly set to match any pin size plus or minus the desired clearance or interference fit.

A brief descripiton of the adjusting procedure will demonstrate the simple geometric principles involved. First, a master one-in. pin is placed in a vee-block and the height adjusted so that the indicator contacts the center of the pin. The indicator bezel is set to read zero, splitting the difference in any pin diameter variation.

The 1-in. boring bar is then placed in the vee-block to find out how much difference there is between the mean diameters of the pin and the bar. The bar is then located in the boring head and the pin in the master vee-block. The indicator is pushed back until the shaft contacts the surface of the pin. The button of the indicator will then contact the bar. Adjustment is made in the shaft length until the indicator reads zero with the necessary allowance made for differences in diameters.

In effect, the dial indicator and its shaft are so adjusted that, with the indicator reading zero, the distance from the button to contacting end of the shaft represents the exact distance on the machine between a theoretically perfect 1-in. boring bar and a similar 1-in. pin located in the vee-block. With this distance accurately set, it is possible to use it for setting the cutter to bore the correct sized hole for pins of any size within the capacity of the machine.

The geometric principles involved are shown in the accompanying sketch. The tool bit is clamped in the boring bar of proper size, the pin located in the master vee-block and then tool adjustment takes place. A tool adjuster, hooking over the boring bar, offers a means of advancing the tool against the indicator button until the dial reads zero plus or minus the fit increment. Dial readings are direct, a tenth on the dial meaning a tenth on the diameter.

Damped Boring Bars

Having discussed the method of getting fits the next is one of surface finish and accuracy. Unsupported boring bars, particularly in the smaller diameters, generally have a tendency to chatter. The vibration may be induced within the machine or may be from external sources such as other heavy machinery in the building or a passing train or heavy truck.

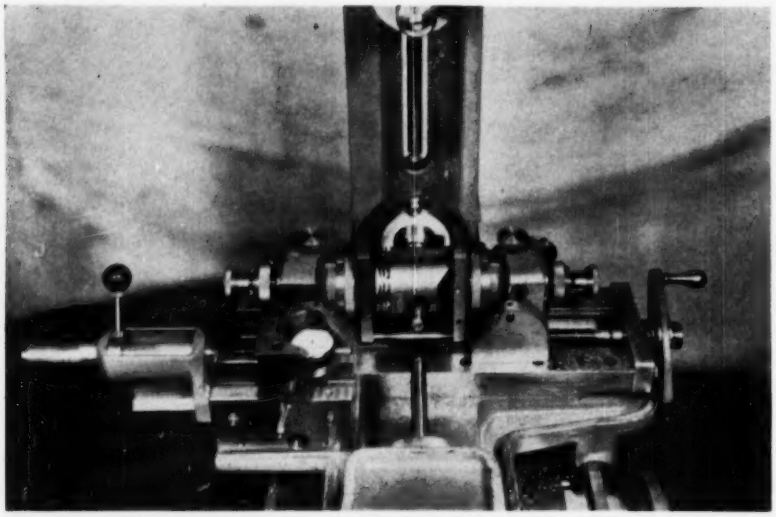
Conditions within the machine such as a bad ball bearing, uneven drive belts or features of operation may induce chatter. Varying material hardness, boring of a hole off center from an existing one thereby varying the thickness of the metal cut, incorrect or dull tool bit, etc., are some of the other reasons for chatter.

In the last few years the gyroscopic principle has been applied, making it possible to use long bars with the chatter under control. In the end of the bar is a slug of a special heavy metal which rotates freely in a hole slightly larger than the slug. The action, referred to as "inertia damping", relies on the gyroscopic effect, set up when the bar rotates, to dampen the effect of disturbances that would ordinarily induce vibration and chatter.

Clamping Fixture

Another feature of the machine is the fixture for the accurate and rapid positioning of pistons. An elaborate form of vise, it clamps the piston between two plates that can be fitted with various adapters to suit the piston design.

Clamping pressure is controlled to a maximum of 50 lb. through a spring and friction slip clutch action. The jaws may be moved either together or separately as desired. The face plate



Looking over the boring head at the table with its knee and vise. Latter is extremely versatile and can be used for holding pistons (as shown) or connecting rods. Jaws work together or independently and face plates are rigid or full-floating as desired.

on each jaw can be released so that it is full-floating, or locked securely so as to be rigid. The full floating feature permits the accommodation of pistons with irregular heads or distorted skirts.

In addition to holding the pistons, the vise is adapted for holding the pin end of the rod for boring by the mounting of two holding pins on the face plates.

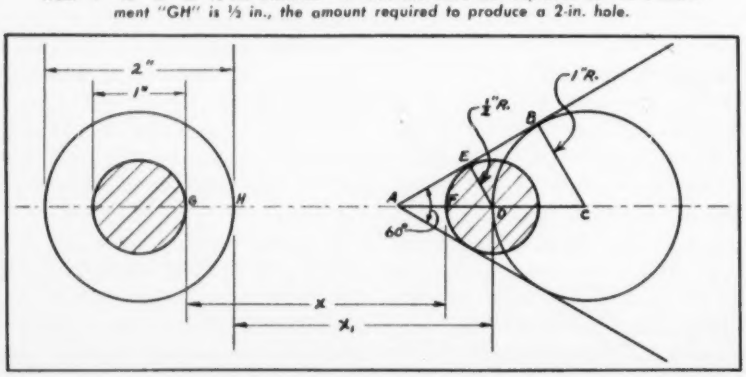
Tool Sharpening

Satisfactory finishes and accuracies are dependent on the condition of the tool point. To insure the proper sharpening, the machine is provided with a lap permanently mounted on the boring spindle and a special tool bit holder (see picture on cover). The tool holder fits on the end of the table and brings the bit into proper angular contact with the lapping arbor. Special fast cutting lapping compound is applied to the arbor face and tool bits are easily kept in good condition.

It is essential that they be kept sharp and tool condition should be regularly checked with a powerful magnifying glass. The tungsten-carbide material selected for the tool is one of the hardest and most brittle. It was found necessary for proper cutting of all the grades of cast iron, aluminum and bronzes encountered. It will hold an edge for a long time but crowding should be avoided.

Proper speeds and feeds should be selected—an adequate range is provided in the machine—and cuts in excess of 0.030 in. should be avoided. A slight radius is generally used on the nose of the tool in the interest of better finish, but should never exceed 0.005 in. in width.

Geometric principle of comparison pin fitting—Shaded circles represent 1-in. master pin (right) and perfect 1-in. boring bar (left). Distance "X" has been established as outlined in the text. Now assume that a 2-in. pin is to be fitted. Geometry of the two similar triangles, AED and ABC, will show that the shaft contact point will move from "F" to "D" or ½ in. Distance "X" will therefore be displaced to "X1". Increment "GH" is ½ in., the amount required to produce a 2-in. hole.



Pin Fitting Jobs

Two jobs are involved in pin fitting; boring the piston bosses, and the eye of the connecting rods. The boring process is essentially the same in all cases, but there is a difference in mounting the work and the reference points used.

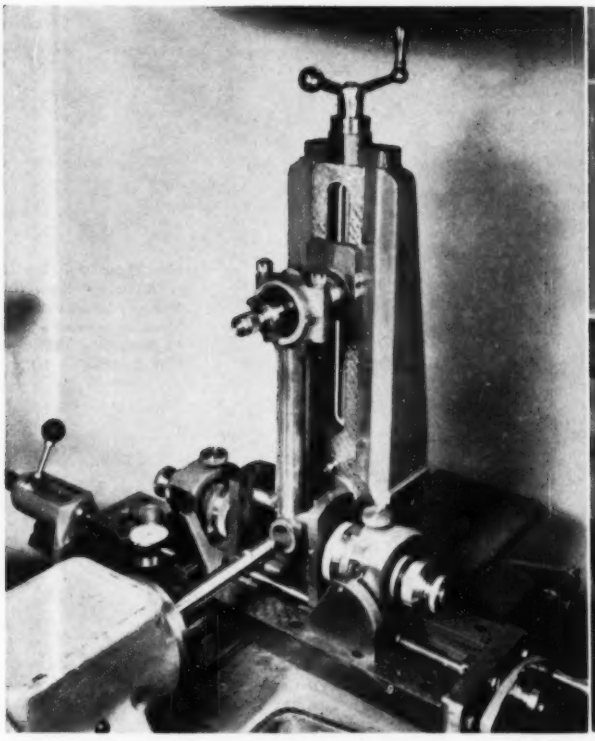
The simplest case is to bore the pin holes in either piston or rod by centralizing in a new or worn hole. In the latter case the purpose is to fit oversized pins. Procedure with respect to pistons will be outlined first.

There is a locating bushing in the knee, the centerline of which is coincidental with that of the boring spindle and bar. An expanding mandrel of the proper size range is placed in the bushing. The mandrel is then expanded until the blades contact the inside of the piston pin hole. This accurately positions the piston while it is clamped in the vise.

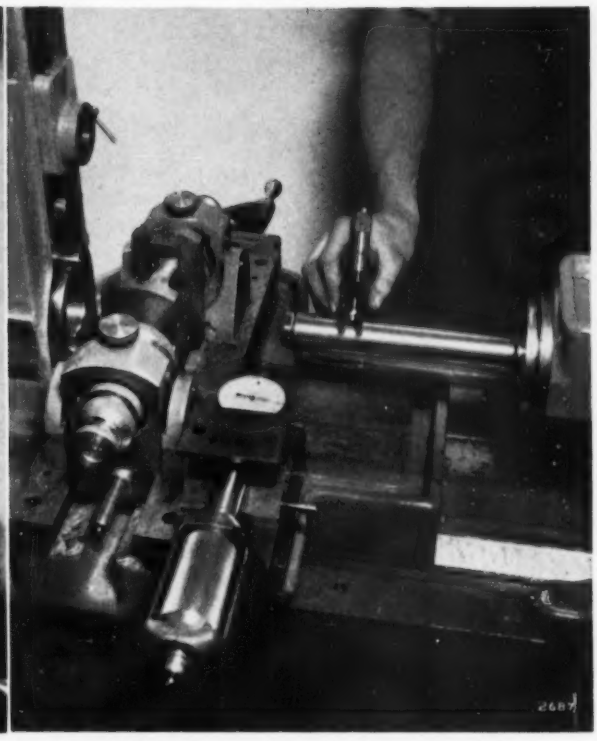
The tool bit will have been adjusted with reference to the pin to be fitted in accordance with the previously described procedure. Once the mandrel is removed, boring can be done.

Now, assume that the connecting rod pin hole is to be fitted for the same pin. The tool adjustment remains as before, the piston is unclamped and the rod positioned. For this, the mandrel is once again used to centralize on the existing pin hole in the rod. The upper end of the rod is retained in an upper holding fixture attached to the knee. Once the lower end is centralized, it is held in place by holding pins mounted on the face plates of the vise. When finally clamped at the upper end, the rod face should be flush against the plate of the holding fixture. Boring proceeds as before.

Note that during these procedures no particular attention has been paid to the matter of alignment of the two bores or the center-to-center distance. This method can be followed when these factors are not considered to be too critical or when the rod is suffi-



Boring the connecting rod eye while holding accurate center distances. Mandrel centers big end and vertically locates it proper distance above centerline of boring bar. Eye is located horizontally by 2-bladed mandrel and then clamped by vise.



A straddle micrometer can be used as shown here in conjunction with a larger diameter boring bar for setting the tool bit. Here, readings are on the radius while when using the comparison method, dial indicator readings are on the diameter.

ciently light to permit later straightening to obtain alignment. Such is not the case with most diesel rods and the machine provides the means for piston pin fitting with these factors in mind.

Alignment and Center-to-Center Distance

The knee is provided with an adjustable upper holding fixture moved by means of a lead screw arrangement. Displacement of the fixture center from that of the lower locating bushing is accurately indexed by a scale and a calibrated dial on the operating crank. It is therefore possible to set the required center-to-center distance.

An expanding mandrel of suitable size is placed in the upper fixture and the blades expanded to contact and properly position the big-end bore of the rod. The centerline of this mandrel is parallel to that of the lower locating bushing and the boring bar. Therefore, the rod is now properly set with respect to alignment and also in a vertical plane.

A mandrel with two opposing blades removed is placed in the lower bushing such that the two remaining blades contact the inside of the pin bore in a horizontal plane. The rod may then be clamped in this position by means of the holding pins and the lower mandrel removed.

When boring new bushings, there should be no question of clean-up. However, when oversized pins are being fitted it is possible that the wear exceeds the stock removal necessary to fit the oversize pin and that the bore does not clean up. Selection of a larger oversize is one possible answer.

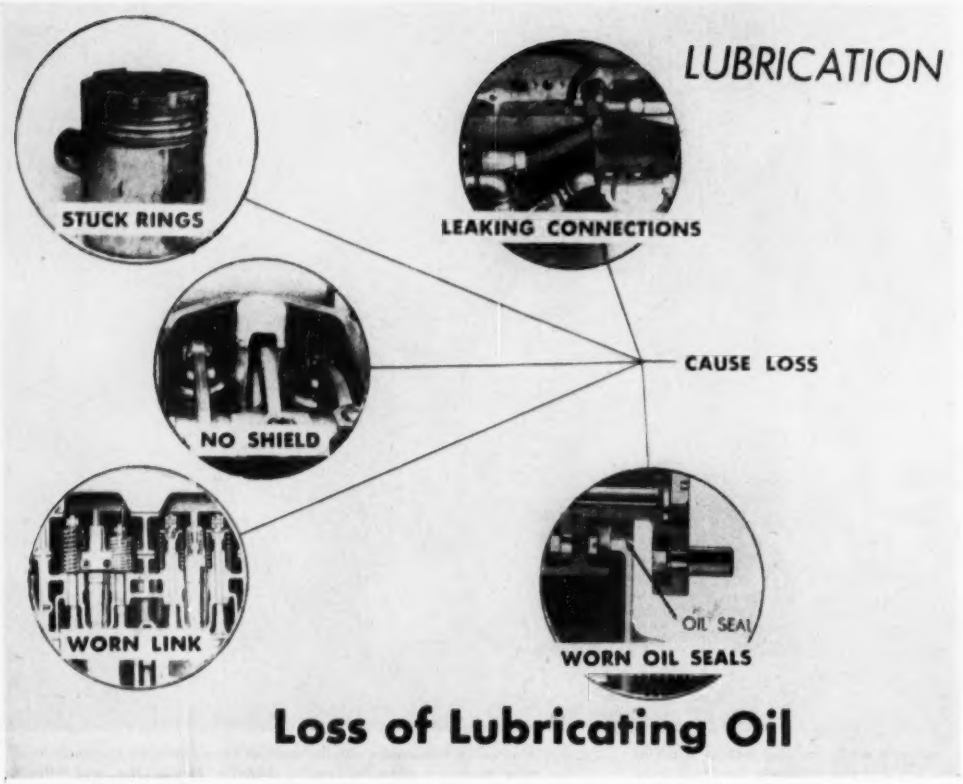
If the particular engine will tolerate a slight variation in center-to-center distance, this may be adjusted to favor the direction of maximum wear and thus permit clean-up. If this is done it is important that the same center distance setting should be used for all the rods of an engine. Failing these remedies, new bushings are indicated.

Oversize Pin Selection

In the reconditioning of piston pin holes, it will be found that most of them are bell-mouthed and out-of-round by several thousandths of an inch. Good practice dictates the use of pins at least 0.005 in. larger than the pin being replaced. Invariably, in reconditioning a set of rods there will be several that will not clean up with the removal of less than 0.005 in. If these are encountered after some have been bored to a smaller oversize, there are the alternatives of reboring to the larger size or of splitting another set of oversize pins. By stocking only standard oversized pins—0.005, 0.010, 0.015 in.—the difficulty can be avoided and a shop's inventory materially reduced.

Summary

This machine, as is readily seen, performs a complete service on pin fitting without requiring a master machinist to operate it. Each pin is specifically fitted to its particular bushing, and can be fitted with any desired clearance or fit. Design features permit the work to be done rapidly and with extreme accuracy. In view of the precision demanded in modern day engines the machine should go a long way toward obtaining the long service between overhauls that is now expected.



Five of the main checks to be made when the loss of lubricating oil becomes excessive are illustrated in the photo-diagram at left.

Trouble Shooting

*by Harold H. Hall**

THE terminology "trouble shooting" means locating the cause of the difficulty in order that permanent repairs can be made. I use the word "permanent" because of the comparative period of service obtained when repairs are made without locating and correcting the basic cause of the failure. This practice usually results in a repetition of the failure and this becomes expensive, in addition to increasing total time out of service on the unit.

Many individuals who are qualified to do trouble shooting are hesitant to tackle an assignment of analyzing a failure due to the erroneous belief that this type of work requires an engineer. Actually, trouble shooting, in many cases, is very simple. In the majority of problems the only requirement is a knowledge of the construction of the units and the principles of its operation. Knowing these two factors, anyone who is qualified to make repairs on the unit can start at the beginning and follow through each step in the functioning of each part until the cause of the trouble is found.

This sounds easy and it is easy, providing the individual doing the work does not become excited and begin to jump to conclusions or begin to disassemble the unit before he does sufficient analyzing of the problem. I would like to use a few examples to illustrate the facts stated. I believe the majority of you are familiar with Cummins diesels and the examples will refer to these engines.

I will start with an example that is normally handled with ease in the field. While a locomotive is in operation, the engine suddenly stops and the operator is unable to start it by the usual procedures. Let us assume the operator checks the fuel supply in the tank and finds this to be O.K. He will then report the failure to the proper individuals and request that repairs be made. The individual assigned to this job must know the principles of operation of diesel engines in general and the Cummins fuel system specifically. With this information he will know that any diesel requires:

1. Air to be introduced into the cylinders.

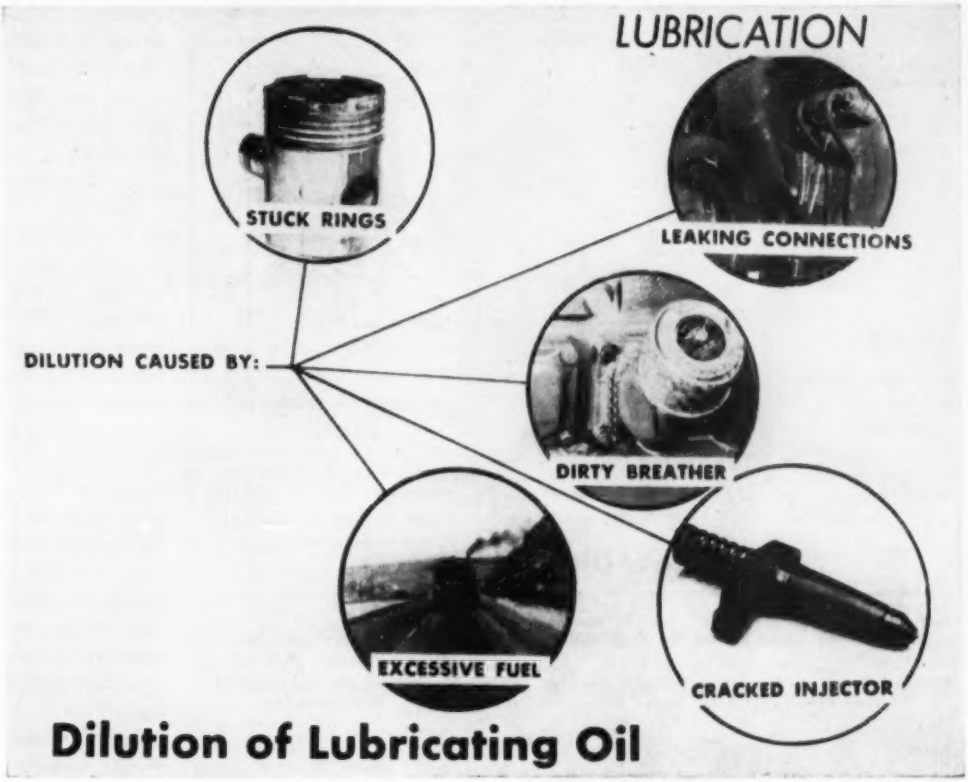
2. This air to be compressed until the increase in temperature is sufficient to ignite the fuel.

3. Proper quantity of fuel to be injected into the cylinder at the proper time.

If these three factors are even relatively close to specified values, the engine will at least operate with no load applied. Since it was running before the sudden failure and won't start now, one of these requirements must be missing.

In trouble shooting, it is desirable to make the easiest checks first to save labor and time. The air intake can be easily checked for restriction.

**General Service Manager, Cummins Engine Company, Inc. Abstract of a paper presented before the Railway Equipment Operation and Maintenance Section, U. S. Army Transportation Corps, Marietta, Pa.*



Dilution of lubricating oil may occur when any or all of the five conditions shown in the photo-diagram at right are present.

In this straightforward paper, Mr. Hall demonstrates the type of "organized thinking" required for analyzing engine failures. Two examples are cited.

and compression can be roughly checked by barring the engine over and at the same time observing valve and injector action for any indication of malfunctioning. These factors appear to be O.K., so the conclusion is that the fuel system is responsible.

The Cummins fuel pump consists of a No. 1 gear pump which transfers fuel from the supply tank to a float chamber located on the fuel pump, a No. 2 gear pump which takes fuel from the float chamber and delivers it, through a distributor disc and cover assembly, to the metering pump. The metering pump measures the proper quantity of fuel and delivers it, through a distributor disc and cover assembly, to the proper injector at the proper time.

In order to quickly verify our conclusion that the difficulty is in the fuel system, we can disconnect the fuel line at the injector inlet connection and, with throttle in maximum fuel position, turn the engine over with the starter. If no fuel is ejected from the fuel line, our conclusion was correct. We then start at the beginning:

1. If the No. 1 gear pump is working properly, the float chamber will be full to the normal level.

2. If the No. 2 gear pump is working properly, fuel will flow from the disconnected fuel supply line when the priming valve is opened and the engine turned over with the starter.

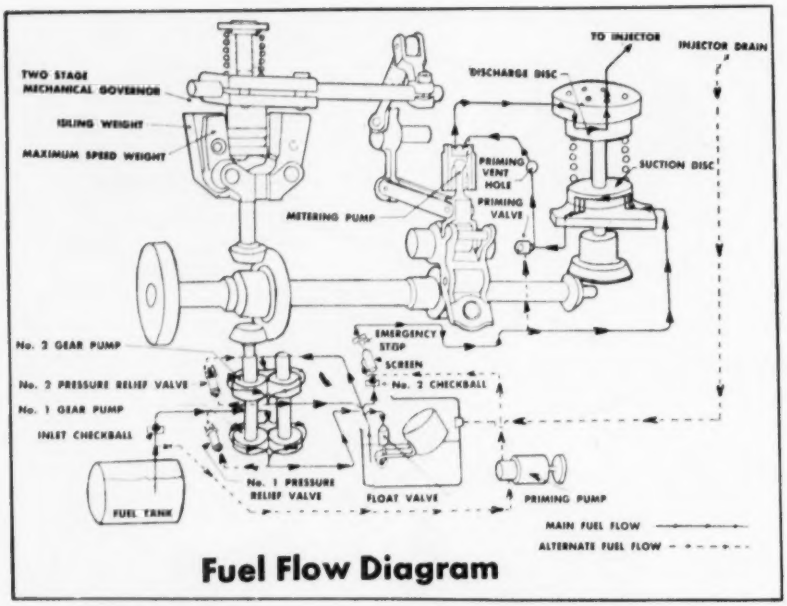
3. Since trouble has not shown up in preceding checks, it will be found in the distributor disc and cover or the metering pump. It would be natural to remove the disc and cover assembly would follow. The mechanic could then determine the cause of the metering pump failing to function and make the necessary repairs.

I know of instances where engines have been disassembled in the search for the cause of this type of failure. Why? Because of not analyzing the failure, or in plain language, the failure to think before acting.

Many people will say that this is an extremely simple example. Actually, it is just as simple on other types of problems as it is on this one, the only difference being that you have a different set of component parts and a different sequence to follow. Let's study a different type of problem and see if we can prove this statement.

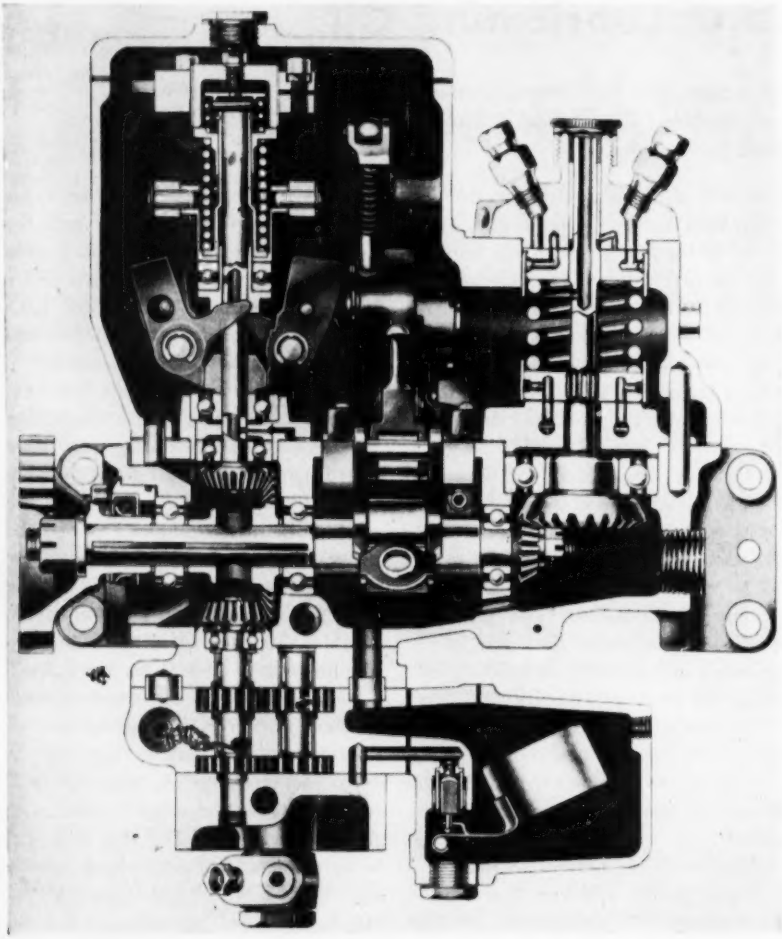
I know that many of you have experienced excessive oil consumption on engines in the past. You have heard maintenance people discussing the problem and realize that there are many different opinions as to the cause of oil consumption, but how many times have you heard anyone definitely tie down the location of the trouble and then attempt to analyze the problem to determine the cause?

The terminology "oil consumption" is used whenever, in the opinion of the operator, an engine requires an excessive quantity of make-up lube oil. Sometimes the cause of the complaint is right here. The very first step is to make a thorough check of the amount of lube oil added over a specified period of operation. Let's as-



Fuel flow diagram of the new Cummins DD (double disc) fuel pump above. The DD fuel pump is standard equipment on the Models JBS-600, NHS-600, NVH-1200 and the NVHS-1200.

Cutaway view of the Cummins DD (double disc) fuel pump below, showing the fuel distributor (upper right); gear pump (lower center); and governor (upper left) assemblies.



sume this is done and the engine is using an excessive amount of oil. The first question is where is the oil going and again the individual making the investigation must know the principles of operation in general and detailed construction of the engine.

The first and easiest check to make is for external leaks. This should be thorough and of course will require cleaning of the engine and then observing it after operation. No major leaks are found, so we must look elsewhere. Since excessive make-up oil is required and it is not showing up as a leak, it must be getting into the combustion chamber and being burned. Knowing the construction of the engine, we know it can get into the combustion chamber by several routes.

1. Entering fuel returned from injectors if seals are leaking and then later being injected with the fuel, into the cylinders.

2. Entering the fuel through leakage by the seal between the governor and the fuel pump housings on some model pumps.

3. Entering the combustion chamber by passing down the intake valve guide.

4. Entering the exhaust manifold by passing down the exhaust valve guide and then going out the exhaust system with the gases.

5. Entering the combustion chamber due to leakage by piston rings.

6. On a supercharged engine, oil can enter the air induction system if leakage occurs at the supercharger seals and will be carried into combustion chamber.

7. If the engine has the crankcase ventilated and the scavenging is accomplished by a passage connected to the engine air induction system, oil can be pulled over into intake air stream if provisions are not provided to prevent this from occurring.

Oil loss through air compressor or other similar auxiliary equipment which is lubricated by the engine lube oil system.

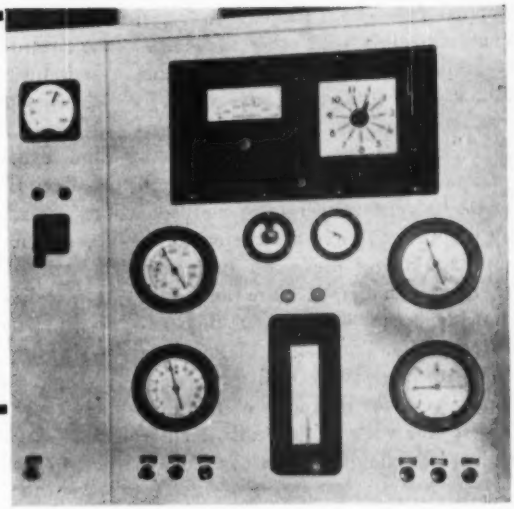
Any individual who is sufficiently acquainted with an engine to perform maintenance operations knows these facts and if he will stop and think he can outline a course for his investiga-

(Continued on page 94)

Why Pyrometers?

*by J. A. Obermaier**

A review of the nature, care and use of this important engine instrument.



Portion of control panel showing continuous monitoring type pyrometer with automatic engine shut-down feature.

PYROMETERS have become so commonplace as a part of an engine's instrumentation that they are frequently taken for granted or not thoroughly understood. For this reason an occasional review of the pyrometer's design features, its functions and use, as well as its care, is helpful.

A pyrometer is a device by which heat energy is converted into electrical energy so as to simplify the instantaneous reading of temperatures on a sensitive meter. It is a convenient system that also permits remote indication.

The temperature sensing element is a thermocouple—generally iron and constantan for the temperature range of diesel exhaust gases—enclosed in a protection tube of a metal such as stainless steel. The electrical output is a function of the temperature at the junction of the metals and therefore can be calibrated to read as temperatures on the meter scale.

For diesel engines a thermocouple is generally installed in the exhaust elbow of each cylinder. A single meter is connected to any selected thermocouple by means of a multi-point switch. This is the most common arrangement, but modern trends toward more automatic operation and increased protective features have led to the development of more complex systems.

An example of this is the combination pyrometer and motor-driven switch units of the type installed in the Alcoa Point Comfort aluminum ore reduction plant. To facilitate rapid monitoring of exhaust temperatures, an electric motor drives the switch that serves to connect each cylinder thermocouple to the meter in turn.

Overlapping contacts prevent the needle from tending to drop to zero during the change from one cylinder to another. Thus, temperature readings on a well balanced engine should be substantially constant and a deviation from the norm is immediately noticeable. A synchronized pointer shows the offending cylinder. All indicators are so sized that they are visible from up to 20 feet away.

In addition to the increased facility in monitoring exhaust temperatures, this type of pyrometer permits the adaption of an additional safety device. It can be fitted with an excess temperature cutout. With this device, the maximum allowable exhaust gas temperature can be set on the meter and should the gas from any cylinder exceed this set limit, visual and audible alarms are instituted and, if desired, the engine can be shut down as well. Reset is manual.

No matter what system is used, the principle remains the same and the functions and correct use of pyrometers should be understood.

Function and Use

The primary function of the pyrometer is, of course, to measure temperatures and to see the tie-in, it must be made clear that engine exhaust temperatures have a direct relationship with events taking place within the cylinder.

In normally operating cylinders the exhaust temperatures vary with the load. Therefore, if temperatures are normal as specified for the engine it is a good indication that things are as they should be. Distribution of load among the cylinders can be checked by comparing the temperature readings of each cylinder. For maximum accuracy, an indicator should be used for balancing the cylinders and then the temperature readings noted. This will be discussed in greater detail later.

Now that the engine is known to be operating well, the pyrometer assumes the function of a maintenance tool. Periodic observation of cylinder exhaust temperatures will indicate the first sign of change. Remember that "change" is most significant. Any malfunctioning of the engine will be reflected in the exhaust temperatures.

Nearly all troubles encountered in diesel operation are the result of maladjustment or wear. These will manifest themselves in a number of ways—improper injection, blow-by, stuck rings, other deposits, etc.—all of which are related to cylinder efficiency. Early trouble stages will reflect in a change (high or low) in cylinder exhaust gas temperatures.

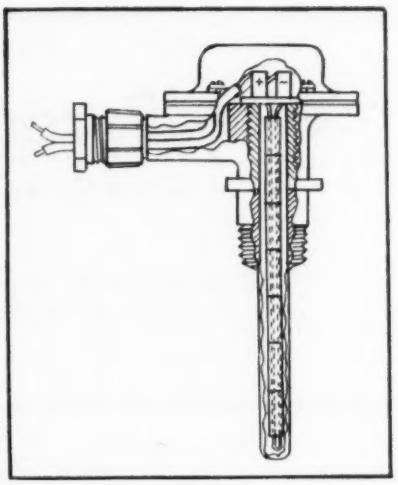
It is simple matter to tell by pyrometer reading whether the trouble is confined to a single cylinder or is

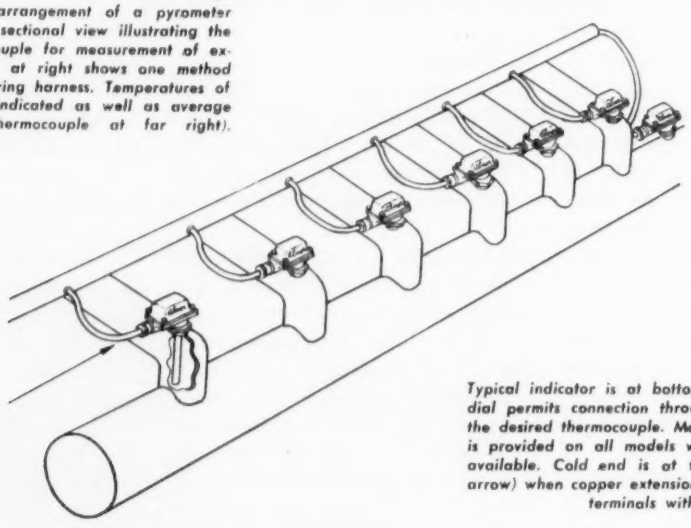
*Chief Engineer, Illinois Testing Laboratories, Inc., Chicago, Ill.

general throughout the engine. Then, combining this with other "tell-tales" it is possible to analyze the trouble and correct it in the early stages.

Combustion efficiency is reflected in three references that can be conveniently instrumented. In addition to the exhaust temperatures measured by pyrometers, these are the compression and firing pressures. Indicators of the maximum pressure and card drawing types will supply this additional data. Correlation of the three items of information will serve as a sound basis for diagnosis of troubles. Visual aids such as the exhaust color and noises should not be overlooked. These, along with the pyrometer, are the first detectors of brewing trouble. To indicate the method of analysis a few examples are given.

One of the most common causes of high exhaust temperatures is overloading. If the temperatures in all of the cylinders are consistantly high, the engine as a whole is overloaded; if only one cylinder is high, the trouble lies in the particular cylinder. A general overloading will be accompanied by high firing pressures and, depending on the degree of overload, may show exhaust smoke. In the case of a single cylinder, it is probably due to faulty injection equipment or maladjustment of the control linkage. High firing pressures will also be characteristic.





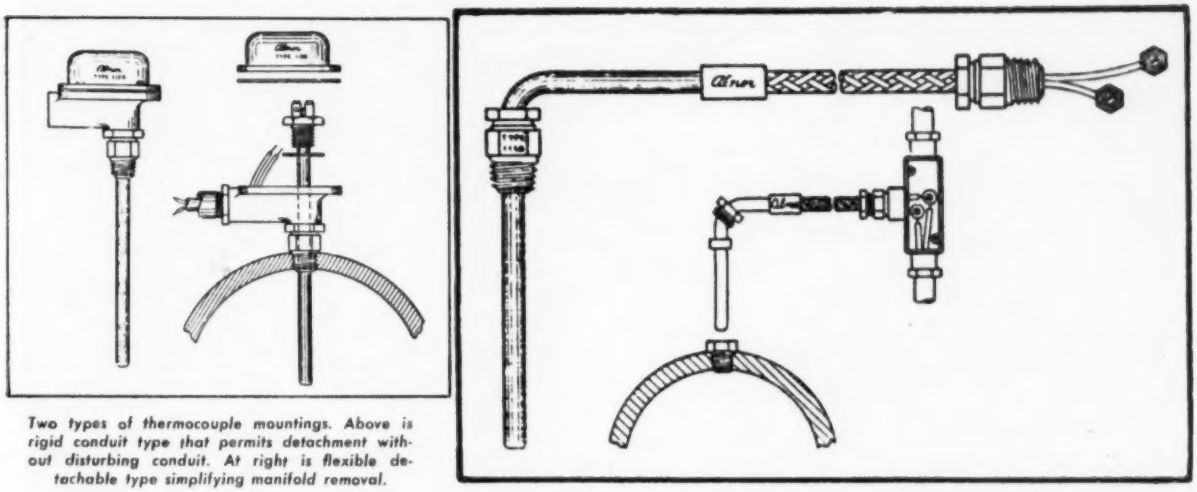
Components and typical arrangement of a pyrometer system. At top right is a sectional view illustrating the construction of a thermocouple for measurement of exhaust temperatures. Sketch at right shows one method of installation and the wiring harness. Temperatures of each exhaust elbow are indicated as well as average manifold temperature (thermocouple at far right).

Typical indicator is at bottom left. Lower knob with its dial permits connection through a multi-point switch to the desired thermocouple. Manual cold-end compensation is provided on all models with automatic compensators available. Cold end is at thermocouple terminals (see arrow) when copper extension wire is used and at switch terminals with alloy wire.

Another reason for high exhaust temperatures is poor dissipation of cylinder heat to the water jackets. Scaling is a prime cause of this trouble because of its insulating qualities. Other contributory factors leading to high cylinder temperatures are: excessive friction created by faulty lubrication, partial piston seizures, excessive blow-by, etc.; and interference with the scavenging process such as by the carbonization of ports or intake passages. Shortage of air, whether it be the result of restriction of the scavenging air passages, faulty blower or air filter troubles, will cause high exhaust temperatures generally accompanied by a smokey exhaust.

The pyrometer will prove helpful in pinning down the particular trouble involved. For example, clogging of the scavenging air passages might occur in a single cylinder. The temperature reading for the particular cylinder would reflect this and the cause could be determined and corrected. On the other hand, a plugged air filter or leaking blower would affect the engine as a whole and reading on all cylinders would be high.

Low exhaust gas temperatures may be entirely normal since they will be reduced as load decreases. Most low exhaust gas temperatures brought about by other causes will be the result of insufficient fuel or poor ignition. These troubles will be accompanied by loss of power and ragged operation. Improper fuel, especially with regard to cetane rating, excessive-



Two types of thermocouple mountings. Above is rigid conduit type that permits detachment without disturbing conduit. At right is flexible detachable type simplifying manifold removal.

ly low engine temperatures, and water in the system are some possible causes of these conditions.

Fuels and the fuel system adjustment are frequent sources of faulty combustion. Improper fuel injection, pre-ignition, delayed ignition, rapid burning, sluggish burning and afterburning of the fuel will all affect exhaust temperatures. These all are functions of the fuel used and/or engine condition or adjustment. Injection timing, for example, is important. Early injection will result in low temperatures while late timing will have the opposite effect.

It is necessary that the interrelation of all the various factors be known if an intelligent trouble analysis is to be made. With this background, the pyrometer can be used to detect incipient troubles and then aid in locating them.

Care

Like all precision equipment, pyrometers require a certain amount of care. They also have limitations that should be understood if the user is not to be misled.

The primary unit of the pyrometer system is the thermocouple and as such it governs the accuracy of the system. They are rugged in construction, but should be protected from severe blows and other unusual treatment.

It should be understood that the pyrometers read average temperatures in the particular location where they are installed. The thermocouples are subjected to widely fluctuating temperatures during the cycle and, thus, must indicate an average. Being in the exhaust stream they are subject to the formation of carbon deposits that will alter their output characteristics. In addition, certain irregularities of a particular cylinder's component parts may lead to a stratification or deflection of the gases and alter the readings somewhat.

As has been pointed out, actual temperature readings are not so important as variations from the normal. However, if the readings are not reasonably accurate to begin with (compared with recommendations for the particular engine) there is no means of knowing whether the "normal" is actually too high or too low. It is possible to check the engine performance by means of an indicator.

Once the engine is shown to be operating normally, cylinders balanced, etc., the readings for each cylinder can be recorded as "normal" and variations from this will then reflect the beginning of troubles.

Carbon deposits on the protection tubes has been mentioned as an interference with normal heat transfer. These deposits should be removed carefully whenever the condition warrants and opportunity exists. For maximum uniformity of readings, cylinder to cylinder, all thermocouples should be cleaned at one time. Should a thermocouple require replacement, the type and characteristics of those in use should be duplicated.

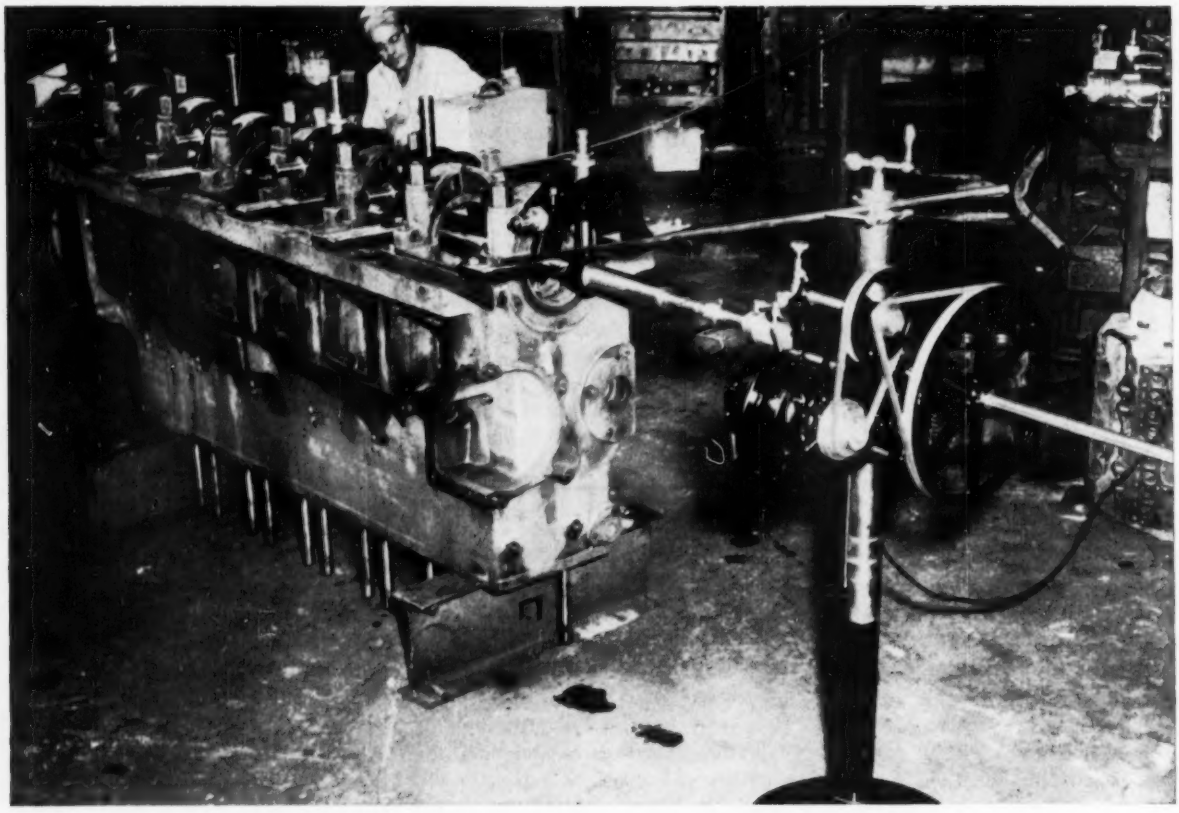
The balance of the system is essentially an electrical circuit and as such is cared for in much the same way. Wires should be protected from injury to avoid shorts and grounds. Partially broken wires, loose or corroded terminals will all alter the resistance of the circuit and could lead to misinterpretation of inaccurate temperature readings. The meter should be accorded the care usually given to this type of equipment.

Conclusion

Properly and conscientiously used, the pyrometer will pay for itself over and over again as an important aid in securing maximum economy and minimum maintenance costs. It is the primary and most convenient means of checking on combustion efficiency.

Do You Need Trained Diesel Men ?

A card to DIESEL POWER AND DIESEL TRANSPORTATION will bring you our listing.



Boring bar and drive set for align boring a block. Note both horizontal and vertical adjusting mechanism on both end bridge castings. Drive unit is steadied by reacher rod to extension pan rail.

Align Boring Main Bearing Saddles

Warped blocks, damaged bearing saddles and stretched or distorted caps are the more common reasons for bearing misalignment. Here are some pointers on how this condition can be overcome and some of the considerations involved.

Misalignment of the bearing saddles of an engine will be reflected in the positioning of the bearing shells and will result in crankshaft deflection, excessive and uneven bearing wear and when severe enough, will cause bearing failure and even shaft breakage. The condition, obviously, cannot be tolerated for long.

The condition can be detected very easily in large engines by measuring crankshaft deflection, using a dial indicator or similar device placed between the crank webs. However, in the smaller engines it is more difficult and in fact, generally impractical to check for the condition by this means.

After bearing trouble, the condition should be suspended and a check should always be made during a complete overhaul. Now, the question is, "How do you check it?" Damage to a bearing saddle is generally obvious. Minor misalignment is more difficult to detect, but, none the less, a condition that should be corrected.

It is good practice to examine all of the bearings removed from an engine. They tell a story if you take the trouble to interpret it. Uneven wear near the edge of the bearing or deformation of the metal is generally a sign of misalignment. A straight shaft will try to wear a true bearing surface with the result that high pressure and temperature will be concentrated at the point of least clearance.

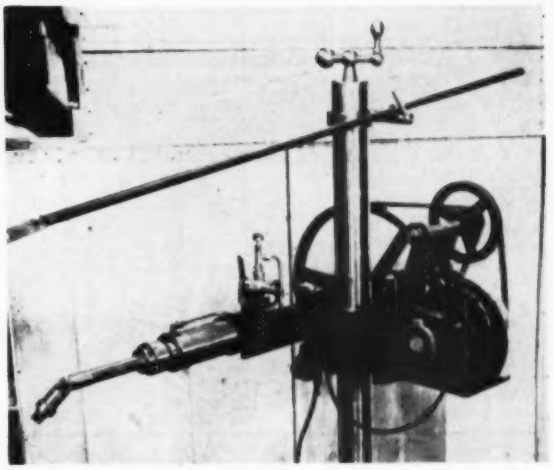
Many shops make it a routine practice to check for misalignment during an engine overhaul by using a boring bar. Even minor substitutions can be found and corrected. It is important that this be done when new bearing shells are to be used because, as the condition developed in the engine, the old shells may have slowly conformed and kept the engine out of trouble. When new shells are installed the amount of conformation immediately necessary may be so great that pressure and temperature concentrations may lead to rapid failure.

What's a Boring Bar?

Those who still adhere to the virtues of the old hand-scraped bearings have a lot to learn. After tedious scraping and blueing, the result was, perhaps, a 40 per cent bearing area, and no-clearance fits with long break-

in periods were necessary for the shaft to wear its own clearance and shape the bearing to a good fit.

Precision machining of bearing supports and precision bearings have obviated all this. Boring bars do the production boring on new engines and more adaptable versions are used to correct any later misalignment. A rigid bar carries tool bits spaced to bore each bearing of a single set-up, thereby insuring alignment. The next problem is to obtain a simple and rapid means of mounting the bar on different engines and to properly locate it so that the bored holes are where you want them.



Six cutting speeds and a hydraulic infinitely variable feed are incorporated in the drive unit. Crank at top is for vertical alignment; pedestal base is moved for horizontal line-up.

Each make of align boring bar will have its own features, but the general principles of operation remain the same. Basic criteria for this equipment is that it be capable of doing a good accurate job and from this point on, the facility and speed of set-up is important from the labor cost angle. For purposes of this discussion, the bar produced by the National Welding and Grinding Co., Dallas, Texas, and their recommendation for its use will be used for illustration of the technique of align boring.

The features of this bar are: A unique type of support casting which can be bolted to the crankcase without any harmful results from distortion; a style of clamps for the movable parts that do not in any way disturb the position of the bar by their clamping action; and a screw feed adjustment for both horizontal and vertical motion for positioning of the bar. This enables the bar to set in the exact center of front and rear bearing saddles, thus assuring correct gear meshing. With a small amount of special bushings, etc., the bar can be set from the actual mesh of the crankshaft gear with the other gears.

A vertical screw adjustment enables the lifting of the bar between end supports until it is proved that all sag of the bar has been removed. Five of these supports are supplied and the usual length of the large 2-in. diameter bar is 7 ft., although extra long bars can be supplied. An 1¼-in. bar is also supplied for work too small for convenient use of the larger bar.

Another feature is the tool setting arrangement by which an operator can readily set tools to bore well within the required tolerances.

A driving device operated by an electric motor provides power at six different speeds for turning the bar and a hydraulic cylinder provides feeds in either direction. A control valve gives infinite feed speeds to suit the work.

This equipment was designed to service most any engine up to the largest sizes of portable engines. Also special equipment is provided to align bore cam bearings in a very quick and convenient manner.

Points to Consider

Certain principles must be observed if the realigned saddles and caps are to support the precision bearings and provide a true, straight bed for the crankshaft. Some of these are:

1. The centerline of the boring bar should coincide to the greatest possible degree with the design centerline of of the crankshaft.
2. An absolute minimum of stock should be removed from the saddles so as not to disturb the relationship of the shaft to other engine components, particularly driven gear trains.
3. Final sizing of the bores should be to exact specifications so that the proper amount of "crush" takes place in the bearing shells.

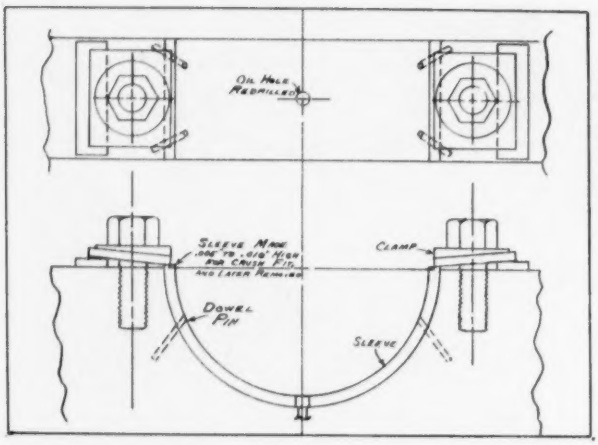
Some reference points must be used to insure that the bar is properly located. Generally, the flywheel and front end bearings serve this purpose. Being more rigidly tied in with the block structure and in the case of the flywheel bearing usually of greater length to compensate for radial flywheel loads, they are apt to suffer less from distortion. Additionally, one of these locations, depending on the engine design, are near the point of engagement of gear trains or chain drives. Minimum dislocation is desired here.

Two of the more commonly found conditions calling for align boring are: Out-of-round holes due to distortion, cap stretch, etc.; and misalignment of the bores due to distortion or bowing of the block. In either case it is generally necessary to reduce the size of the hole for later boring to a true and accurate size.

This may be done by grinding the mating surfaces of the cap. Care should be taken to insure that the new surface is exactly parallel to the plane of the old one. Usually, removal of from 0.005 to 0.010 in. is adequate but only enough stock should be removed to permit clean-up.

The caps are then assembled to the block and accurately torqued. This is extremely important since it will reproduce the conditions that will exist when the crankshaft is installed.

In positioning the bar, the principle to follow is that maximum stock removal takes place in the cap. This helps to maintain the original location of the shaft. In some cases it will be necessary to set the bar a few thousandths closer to the cylinder side. When the engine is rebuilt after such an operation, the effect of this dislocation should be checked particularly



Sketch of repair method for damaged saddles used by A. L. Torgis & Sons. Saddle is cleaned up and a sleeve fitted and pinned permanently in place.

when gear trains are involved. Gear tooth engagement and backlash should be checked.

Setting Up the Boring Bar

Cleanliness is important. The bar and the saddles should be wiped clean and rags placed in the saddles to protect the bar. Centering discs are selected to fit the front and rear bearing saddles, then the following step-by-step procedure is followed:

1. Slide intermediate bar supports over bar to locations desired.
2. Slide centering discs over front and rear ends of bar and place the assembly so that discs rest in front and rear bearing saddles.
3. Mount extension pan rails at each end of crankcase.
4. Slide bar support over each end of bar in an outboard position.
5. Place a bridge casting over each bar support and bolt to rails and crankcase.
6. Lock clamps on bridge castings.
7. Remove centering discs.
8. Set a tool bit to bearing saddle diameter at front bearing location. Loosen intermediate support clamps.
9. Using vertical and horizontal screw feed adjustments, so center the bar that the tool just wipes the bearing saddle. Repeat at rear bearing.
10. Lock intermediate bar supports and remove tool.
11. Slide bar out of the front outboard support bearing, then back into it and observe any movement needed to permit re-entry without interference. If interference is found, correct by movement of vertical screw adjustment on the intermediate supports until bar will enter outboard support, as supported, without any interference. Proceed at rear bearing in like manner. Finally tighten all clamps.

Careful attention to Item 11 will insure that there is no sag in the bar and that it is perfectly free and straight. This condition is essential to accurate align boring.

Boring speeds, feeds and depths of cuts as recommended by the manufacturer should be followed in each case. Proper sizing is assured by micrometer setting of the tool bits. Final finish is important for two reasons: Full support is essential for long bearing life; and a good close fit helps to dissipate bearing heat.

Damaged Bearing Saddles

Align boring may also follow repair to a damaged bearing seat. Shells turning in the seat after seizure is one of the more common causes of such damage. Here, it is not generally possible to clean up the bores without building up the damaged seat.

The process at National Grinding & Welding is to pre-heat the block and build up by welding. This is a process requiring careful control in order to avoid block distortion and the introduction of internal stresses. Once the job is complete and the block normalized, align boring follows the previously described procedure with the exception that faces of the seat must be machined as well. New caps are used in this case.

An alternative method of rebuilding the bearing seat is one used by A. L. Torgis & Sons of Toronto, Canada. A bushing is used in their process. The particular saddle is bored to 0.187 (considered minimum thickness for a bushing) to 0.250 in. over-size depending on the diameter of the saddle. A bushing of corresponding diameter is prepared, in many cases made from short ends cut from cylinder sleeves. It is then split leaving from 0.005 to 0.010 in. for "crush".

The bushing is then clamped in the saddle by dogs bearing on the crush area to insure that the bushing fits firmly in the saddle. Holes are drilled through the bushing and into the saddle approximately ½ in. below the mating surface. Pins are then driven into place. Finally, the pins are flushed and after the clamping dogs are removed, the "crush" filed off. Oil holes, of course, are drilled as required.

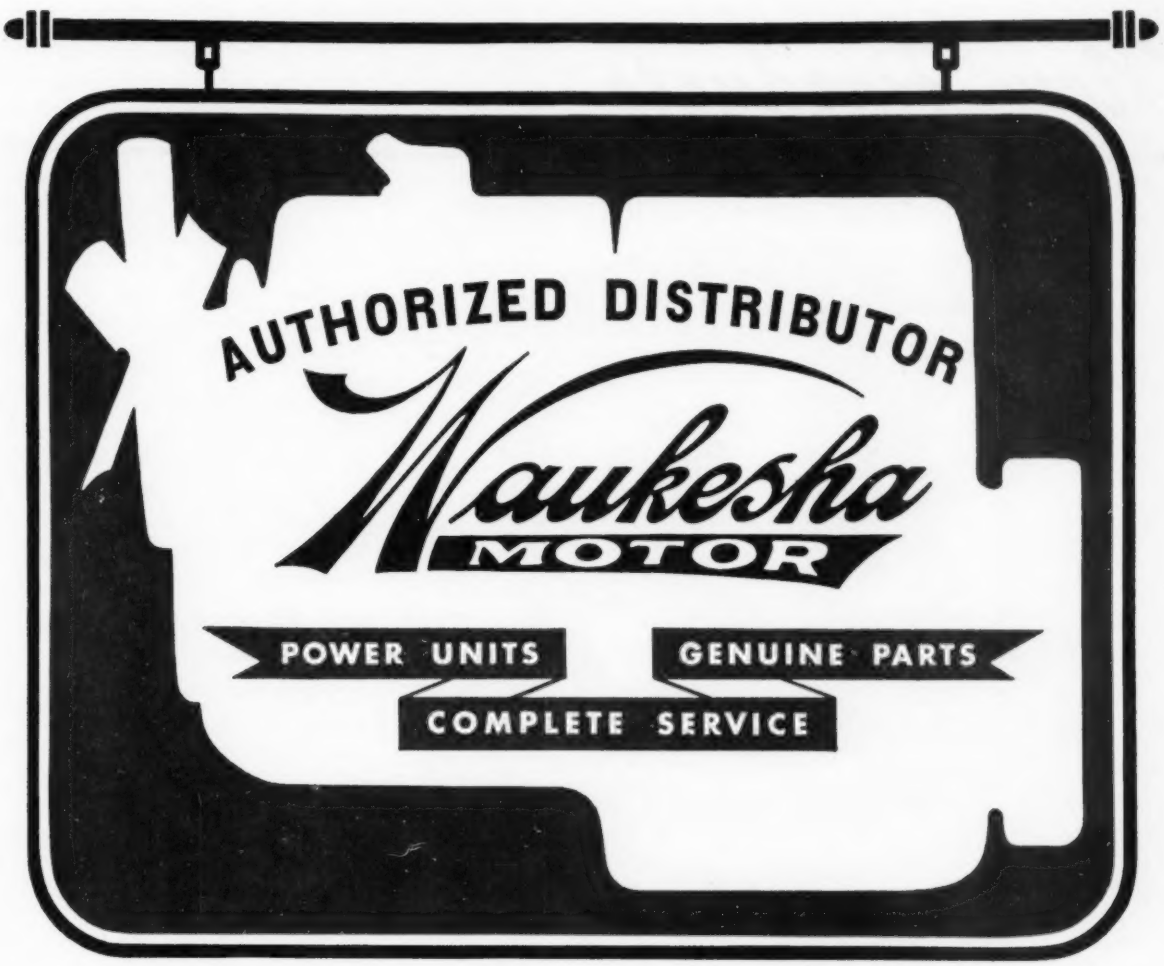
It is usually possible to remove enough stock from the caps to clean them up without resleeving them. Alternatively, new caps can be used and in many cases are cheaper than the cost of the bushing job. Whatever the choice, the caps are then properly torqued and the saddle rebored to standard diameter.

The Torgis organization reports that this process has been used in many hundreds of blocks with no comebacks. Some jobs have been in service for several years and when returned for a general engine overhaul were found to be in perfect condition.

Summary

Success of today's engines with their precision fits depends on how closely the fits can be maintained, particularly during overhaul. Precision tooling and sound, careful procedures are necessary if fits of about 0.0005 in. per inch of shaft diameter for tin and lead base babbitt bearings and 0.0010 in. per inch of shaft diameter for copper-lead bearings are to be maintained.

Bearing alignment, important to long service life, avoidance of crankshaft deflection and reduction frictional loads, is no better than the alignment of the supporting structure. Know-how and the use of good tools go hand in hand in providing this basic engine requirement with the greatest accuracy possible and at a reasonable cost.



You can believe in
THIS SIGN

...it identifies your Waukesha Distributor

How well . . . and how long . . . Waukesha Engines and Power Units perform for the user of a truck, tractor, air compressor, shovel, oil rig, or any other power machinery . . . is of prime importance to the Waukesha Motor Company . . .

And the link between the two—the Waukesha Distributor, is of equal importance.

For your convenience the Waukesha Distributor in your locality has a full stock of Waukesha engineered parts. And an assortment of complete Waukesha Power Units for quick delivery . . .

Experienced mechanics, too—ready to give your Waukesha Engines periodic inspection and tune-up . . . or to rebuild your equipment when needed. Trained engine-specialists perform every service operation by factory-approved methods, and to Waukesha precision standards. The mechanical staff will be glad to give you practical technical advice on any phase of the use and care of Waukesha power plants.

Your Waukesha Distributor is a part of a select, nationwide organization of engineers and service men of specialized experience and the highest reputation. He's a good man to know . . . and you'll like him, too. Look for the sign—stop in and see him. 146

WAUKESHA MOTOR COMPANY, WAUKESHA, WIS.
NEW YORK • TULSA • LOS ANGELES

New Products

New Engine Protector Device

A new device developed by Paxton-Mitchell Co. is designed to help prevent excessive damage to engines and conditions that could cause crankcase explosions.

Known as the P-M engine protector, the device operates on the diaphragm principle. When pressure is present in the crankcase of an engine the diaphragm operates a relay which in turn operates the stop relay in the control circuit and automatically shuts the engine down. Circuits are provided which operate the low lube oil alarm bell and isolate the unit.

Its makers claim this means that a shutdown of the engine will be effected before excessive damage can be caused by broken liners, broken pistons, broken rings or any other cause which would create pressure in the crankcase. The unit is sealed, eliminating the possibility of damage from water or cleaning solutions used in washing down the engine.

The protector can be used on all types of diesel engines, it is claimed. Because it is shipped as a packaged unit, complete and ready for installation with all internal wiring factory assembled, installation is simple and can be made with a minimum of time.

"Cat" Weld-On Plate

Caterpillar Tractor Company has announced recently a weld-on plate for resurfacing track links worn too deeply for the successful use of weld overlays. Applied to D7 and D8 tractors, the new method makes it possible to resurface track links worn in excess of 3/8 inch. Induction hardening is applied to the rail surfaces so that wear normally appears only after thousands of hours of usage. It is recommended that this method be used as soon as tracks links are worn through the original surface hardness of about 1/8 inch.

Successful overlays are possible up to three thicknesses, or about 3/8 inch. Beyond this point, track link plates are estimated to be more economical for the D7 and D8. Made of hardened and tempered steel, these plates resist abrasion and shock.

New Electric Welding Cable Connectors

Tweco Products Company has announced a new line of electric welding cable connections and accessories for use in manufacturing, maintenance or repair of equipment.

Included are electrode holders, carbon electrode holders, ground clamps, cable connections, cable splicers, terminal connectors, solder and mechanical type cable lugs, and "lug-set" block and punch for attaching solder lugs mechanically.

Armature Insulation Tester

A new dc. winding-insulation tester for dc. armatures, series field coils, and low-impedance ac. stator coils, has been announced by the Special Products Division of the General Electric Company. The new device will detect and aid in locating faults in turn-to-turn, coil-to-coil, and winding-to-ground insulation in dc. armatures of any size and rating. It is designed for testing large motors and generators such as those in railroad, marine, and steel industries.

The tester consists of a repeating type, surge-voltage generator which operates 60 times a second and a cathode-ray oscilloscope, all in one cabinet. A fixture is provided for applying test voltage to the commutator of the armature being tested. It is said to be able to check an entire armature in as little as three or four minutes.

GM Engine Indicator

A condenser type engine indicator, adaptable for recording pressures as high as 20,000 psi. has been developed by the General Motor Research Laboratories for use in research on automotive engines, fuels, transmissions, hydraulic steering mechanisms and other industrial problems.

The indicator consists of a pick-up that can be screwed into the head of an automotive engine and is then connected to an electronic oscillator. Changes in engine combustion chamber pressure cause changes in the indicator's electrical circuit, similar to the circuit capacity changes in a radio when it is tuned. Such changes are visible on the screen of a cathode ray oscilloscope by means of an electron beam tracing line. The line traced on the screen is a graphic illustration of the pressure changes in an engine cylinder during a complete cycle of operation. This pressure record can be plotted against time or the engine crank angle.

Temperature Regulator

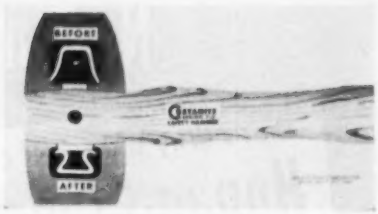
A regulator to maintain liquids or air at any temperature desired has been placed on the market by the Powers Regulator Company. It should find use in the control of water heaters, heat exchangers, jacket water for air compressors, diesel and gas engines, dry bulb and dew point control.

Of the expansion stem type regulator, it has adjustable sensitivity and overheat protection, calibrated dial temperature adjustment, temperature ranges from 50° to 250° F. Compressed air or water at 15 psi. pressure is required for the operation of the regulator.

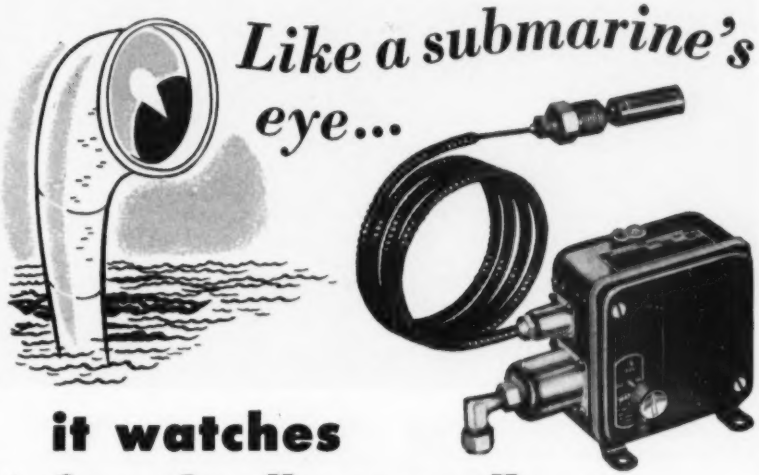
New Soft Hammer

Recently released by the Charles Budd Corporation is the Custanite Spring-Flo safety hammer.

The hammer contains a hardened high-carbon ribbon steel spring at either end of the head. The unique design and special alloy result in a controlled flow of metal in the hammer head despite continuous heavy use. Further, the combination of the spring construction and alloy are warranted



to result in a safety hammer which will not chip, spark or mushroom. The hammer retains its original



Like a submarine's eye...

it watches for the "enemy"

Your engines have two damage-creating enemies! One is low oil pressure and the other is overheated jacket cooling water. But, both *can be detected and stopped* by the PENN Safety Control before they can cause damage and costly repairs.

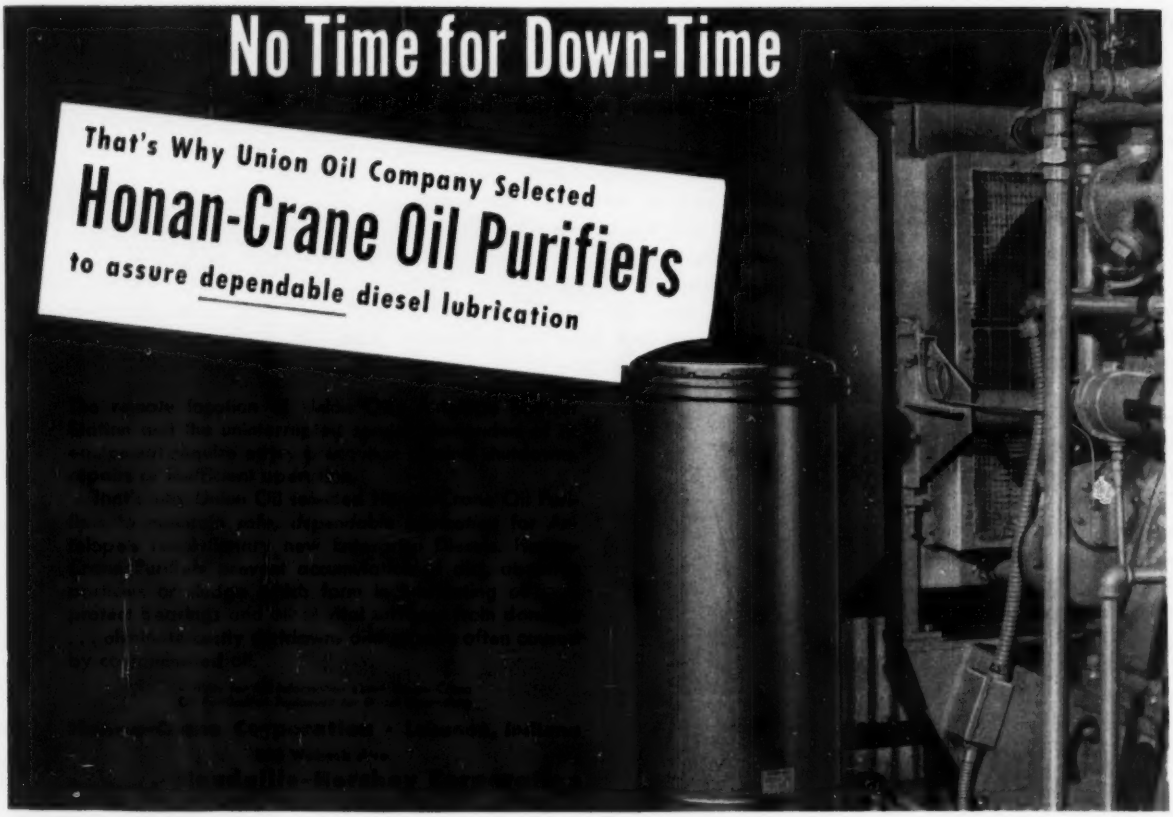
Here's how it's done. If water temperature rises to the danger point . . . or if oil pressure drops . . . the PENN control goes into action immediately! It *automatically* sounds an alarm, flashes a warning light or stops the engine operation . . . whichever you choose. Then the fault can be investigated and corrected *before* damage occurs.

Learn more about this *low-cost protection* for new or old engines. Send for your free copy of Bulletin E-100 which fully describes the three basic models for . . . oil pressure . . . water temperature . . . combination pressure and temperature. Write **Penn Electric Switch Co., Goshen, Indiana.** Export Div.: 13 E. 40th Street, New York 16, N. Y., U.S.A. In Canada: Penn Controls Limited, Toronto, Ontario.

PENN

AUTOMATIC CONTROLS

FOR HEATING, REFRIGERATION, AIR CONDITIONING, PUMPS, AIR COMPRESSORS, ENGINES, GAS RANGES

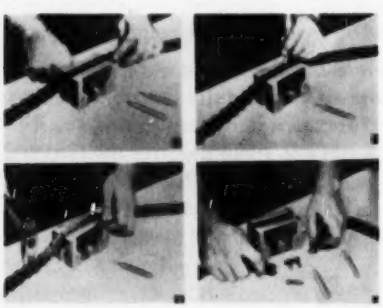

No Time for Down-Time
That's Why Union Oil Company Selected
Honan-Crane Oil Purifiers
to assure dependable diesel lubrication

weight and balance because no metal is lost when in use.

This hammer is available in six sizes from ¾ lb. to 6 lb.

New Chain Vise

A new Baldwin-Rex chain vise, recently announced by Baldwin-Duck-



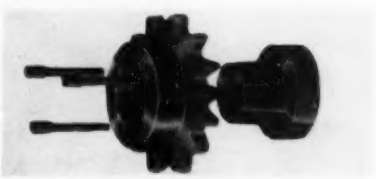
worth Division of Chain Belt Company, is said to make possible the taking apart of a single or multiple strand roller chain in a few minutes with ease.

The chain vise is made of forged steel for long wear, with hardened jaws specially shaped for adapting to various chain sizes. Approximate adjustments are made before the chain is inserted, permitting rapid clamping. It is made in two sizes; No. 1 for single strand roller chains from ½-in. through 1½-in. pitch and for double strand chains from 1-in. to 2-in. pitch.

Interchangeable Hub Sprocket

Development of a sprocket by the Fort Worth Steel and Machinery Company to fit their "QD" V-belt sheave hub so that ther distributors can give immediate "off the shelf" service without reboring on sprockets as well as B-sheaves has been announced.

The "QD" sprocket is taper-bored to receive the tapered hub. Bolts are provided to pull the sprocket onto the tapered split hub for a tapered drive assembly and a positive press fit on the shaft. Tapped holes in the sprocket permit the use of pull-up bolts as jack screws to break the tapered fit when dismounting the sprocket. Set screw over the keyway holds key in position.



These sprockets are stocked at the factory in ½ in. pitch through 1¾ in. pitch.

Steel Hardening Product

Two new, easy-to-use, moderately priced compounds for emergency surface hardening of small tools or parts with an ordinary torch have been announced by Eutectic Welding Alloys Corporation.

"Instant Hardner No. 1" is said to harden steel tools, parts, edges,

threads, dies, drills, etc. without conventional heat treating. "Instant Hardner No. 2", while applied in a similar manner to No. 1, is strengthened with small hard facing particles mixed right into the compound. These hard particles, when heated, fuse with the parent metal to give a combination of hardening and hard overlay, making it particularly effective for such applications as hardening a plate against abrasive wear, etc.

New Swedish Vise

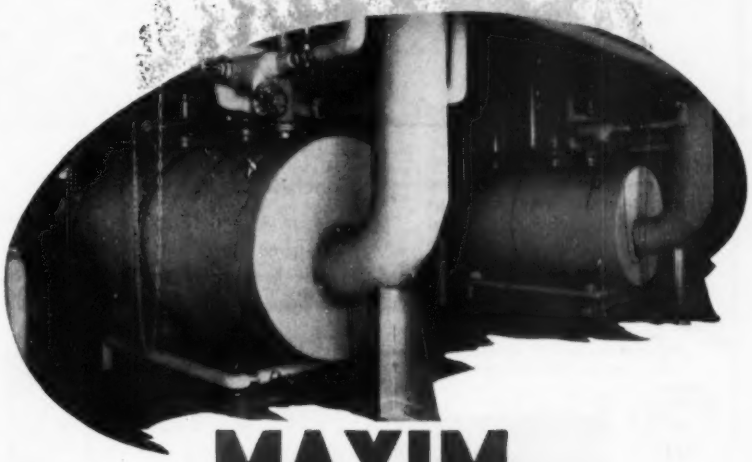
De Widle-Hones, Inc. are the U. S. distributors of a new Swedish vise called "Servo" vise that clamps round, tapered or irregular objects. Its jaws consist of a series of machined and

ground flat plates which hinge or swivel in any desired direction to coordinate with the shape of the held object. They are so designed that they can be moved in relation to each other, and the work piece can rest on a contact surface underneath. By turning the main screw the locking jaws position themselves and can then be locked to retain their directional position. Unlike conventional vises, the tightening screw requires only a slight turn, without imposing a heavy torque, to tightly grip the object. The vise jaws are made of precision ground Swedish steel, and the distance between them 2½ and 5 inches, in two sizes.

Waterproof Service Cover

A new waterproof service cover for the protection of machine tools when they are not in use has been made available by the South Bend Lathe

IS WASTE HEAT WASTING YOUR MONEY?



MAXIM

HEAT RECOVERY SILENCERS CONVERT WASTE EXHAUST HEAT TO USABLE STEAM or HOT WATER

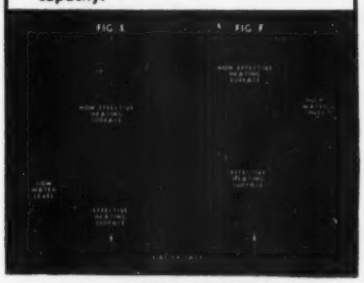
A big Los Angeles Sewage Disposal Plant found that Maxim Heat Recovery Silencers provided all the steam necessary for plant heating as well as heating the sludge — *and from exhaust heat that would otherwise have been wasted.*

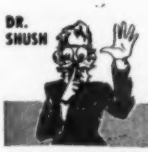
Perhaps your own operating expense picture can be improved by this simple and effective way to provide extra steam or hot water for heating or processing operations while at the same time effectively silencing exhaust noise. Our engineering department will be glad to make recommendations.

Automatic Controls

In figure E water is low and there is less *effective heating surface* (heating surface in contact with water), hence lower steaming rate.

In figure F water is high and gives greater effective heating surface — higher steaming rate. Steam pressure regulated valves control the amount of water to produce desired steam capacity.





Consult MAXIM

THE MAXIM SILENCER COMPANY · 93 HOMESTEAD AVE., HARTFORD 1, CONNECTICUT

Gentlemen: Please send me your Bulletin on Heat Recovery Silencers

NAME _____

COMPANY _____

ADDRESS _____

Alumibond*

The molecular bonding of Aluminum and its alloys to iron and steel and their alloys

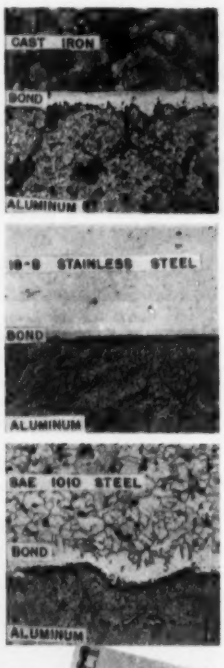
Applications of the ALUMIBONDING process of molecularly bonding aluminum and its alloys to steel or iron are innumerable. In a general way they may be grouped into four classes:

LIGHTWEIGHT... combining the lightness of aluminum and the strength of steel or iron and taking advantage of the machinability of aluminum.

HEAT DISSIPATION

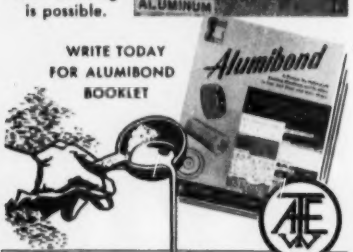
BEARING PROPERTIES

CORROSION RESISTANCE



Pure aluminum or any of its alloys can be bonded to cast iron, carbon steel, high alloy steel, stainless, inconel and many others. Heat treatment after bonding is possible.

WRITE TODAY FOR ALUMIBOND BOOKLET



ARTHUR TICKLE
ENGINEERING WORKS
23 DELEVAN STREET, BROOKLYN 31, N. Y.
TELEPHONE MAIN 5-4200

*Copyright 1951

Works. The covers are not restricted to use with South Bend tools.

Made of tough, durable plastic, the covers will turn water, dust, or grease and are ideal for protecting machinery over night, while in storage, or when the machine is standing idle. The covers are designed to fit over the following sizes of machines: 12 by 28 by 28 in.; 21 by 37 by 24 in.; 32 by 48 by 17 in.; 36 by 72 by 25 in.; and 38 by 96 by 25 in.

Bench-Type Parts Cleaner

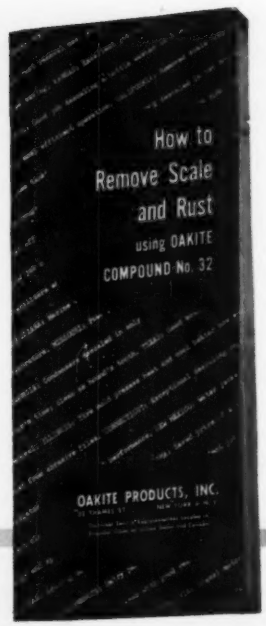
A new bench-type parts cleaner, known as the "brush-flush" has recently been developed by Graymills Corporation. It features a hollow

handle brush attached to the pump, with a tube, to produce a steady flow of clear solvent at the end of the bristles. Oil, grease and dirt are flushed away as they are loosened with the brush. The cleaning solution flowing from the brush is cleared by a double filtering arrangement. Parts are cleaned on the large screen platform. Small particles of grit, chips, etc., passing through the platform screen are retained by the baffle or second filter screen located at the pump intake.

A 2½-gal. soak tank with dip basket, independent of the main tank can be used with either the same, or a different solution. The "brush-flush" is generally placed on the work bench and plugged into any 115 volt electric outlet.

Arctangent Coordinate Paper

Arctangent coordinate paper which should have wide application in scientific, mathematical, engineering, and statistical analysis work has been



Get this FREE Booklet!

YOURS for the asking—this 28-page booklet about Oakite Compound No. 32. Tells how this inhibited acidic compound quickly, safely—without dismantling—descales

- **Diesel engines**
- **Condensers**
- **Heat exchangers**
- **Compressors**
- **Dynamometers**
- **Filters**
- **Transformers**

Get your copy today! Ask your local Oakite Technical Service Representative. Or write.

OAKITE PRODUCTS, INC.
23 Thames Street, NEW YORK 6, N. Y.

SPECIALIZED INDUSTRIAL CLEANING
OAKITE
MATERIALS • METHODS • SERVICE

Technical Service Representatives Located in Principal Cities of United States and Canada

placed on the market by the Orbit Electric Company.

Arctangent coordinates permits the plotting of uninterrupted curves of data having values ranging from plus infinity to minus infinity and including zero as well. Most asymptotic functions become approximately linear in this coordinate system. Examples of applications are the plotting of reactance functions and heating and cooling curves. Extrapolation to zero and infinity are easily accomplished.

New Spur-Gear Hoist

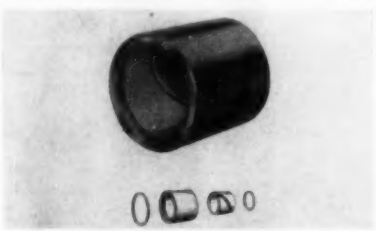
A new spur-gear hoist is now in production in ½- and 1-ton capacities by Coffing Hoist Company.

Strength and resistance to shock-load breakage are gained by the use of formed steel plate in the housing in place of the more common cast aluminum alloy. The back plate is laminated to give extra rigidity for supporting the hoist mechanism.

The hoist is built so that it may be disassembled in a matter of minutes with simple tools, it is claimed. It is also said that it hangs true whether or not it is supporting a load, and that it is sealed and running in lubricant to contribute to long life and high efficiency.

Nylon Bearing

Nylon is beginning to be recognized as a bearing material. It is tough, resilient, resistant to abrasion, with-

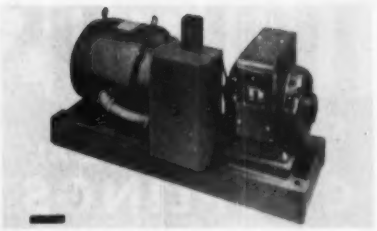


stands temperatures in excess of 250° F, and operates well under adverse lubricating conditions, or with no lubricant at all.

To overcome several limitations which restrict the suitability of plain injection-molded or machined Nylon bearings for many applications, Thomson Industries, Inc., has developed the Nylined bearing. A typical bearing of this type consists of an outer sleeve of inexpensive metal and a relatively thin lining of nylon bearing material.

High Cycle Motor Generator

Used to convert 60-cycle current to 180-cycle and 360-cycle frequencies, is this new mono-coil high frequency motor generator set built by Electric Machinery Manufacturing Company. This equipment finds its greatest use in plants using high-cycle automatic electric hand tools such as grinders and buffers. They are self exciting



and have built-in voltage regulation

Be SURE to get

Your January, 1952

BUYER'S GUIDE

This special issue of DIESEL POWER & DIESEL TRANSPORTATION is now in preparation . . . and is scheduled to be the most comprehensive ever published.

It will help you find the engine, equipment and supplies you need . . . giving you the names and addresses of the leading manufacturers who specialize in diesels and all kinds of diesel accessories.

Fill out this coupon if your subscription does not include the January 1952 issue.

DO NOT MISS THE BUYER'S GUIDE

Diesel Power & Diesel Transportation
192 Lexington Avenue
New York 16, N. Y. NEW ( ) RENEWAL ( )

Gentlemen: I want the BUYER'S GUIDE. My subscription remittance is enclosed for the term checked.

1 year — $3.00 ( ) 2 years — $5.00 ( ) 3 years — $6.00 ( )

Name .....
(please print)

Address .....

City ..... State .....

THOMAS
Flexible ALL METAL
COUPLINGS
FOR POWER TRANSMISSION
REQUIRE NO MAINTENANCE

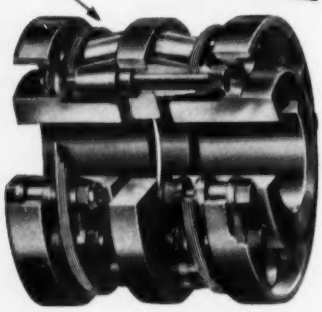
Patented Flexible Disc Rings of special steel transmit the power and provide for misalignment and end float.

Thomas Couplings have a wide range of speeds, horsepower and shaft sizes:
½ to 40,000 HP
1 to 30,000 RPM

Specialists on Couplings for more than 30 years

BACKLASH FRICTION WEAR and CROSS-PULL are eliminated
Lubrication is not required!

PATENTED FLEXIBLE DISCS



THE THOMAS PRINCIPLE GUARANTEES PERFECT BALANCE UNDER ALL CONDITIONS OF MISALIGNMENT.
NO MAINTENANCE PROBLEMS.
ALL PARTS ARE SOLIDLY BOLTED TOGETHER.

Write for the latest reprint of our Engineering Catalog.

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA

which automatically compensates for fluctuation in voltage to the load. Other ratings and speeds are available.

New Masking Method

W. H. Brady Company has announced their new "quik-masks", self-adhesive, pre-cut masks and gaskets that are quickly applied without moistening. They eliminate cutting out masks by hand, metal masks, hand outlining, etc.

The masks are used for name plates, dials, gauges, machined parts, holes, threads, engraved and embossed letters, plated and polished sections or any shaped surface. They provide protection during spray painting, cleaning, plating, machining, tumbling, sandblasting, buffing, polishing, etc.

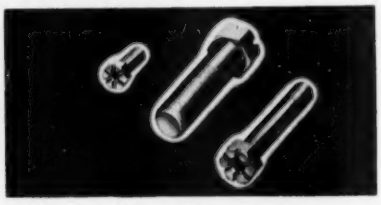
The masks are made from pressure-sensitive masking tapes and come pre-cut to the exact size and shape.

Self-Locking Bolt

The National Screw & Manufacturing Company is now making a new slotted-type "place" bolt that requires no nuts, washers or other devices to lock against vibration when drawn up against a rigid seat.

Cold-head bolts are fully reusable, one-piece and all metal, and can be made of carbon as well as alloy steel. They are available in a range of American Standard sizes from ¼ to one in., in coarse or fine thread pitches.

The bolt's spring action head establishes the locking action and is said to insure against fatigue, impact or



shock failures. Upset slots across top of head divide it into six equal segments. Upset operation also forms a narrow circular recess under the head and next to the shank. The bearing area is the surface under the head and outside the recess. As the bolt is drawn up, the upward pressure on the bearing area slightly displaces the segments on top of the head, to effect the diaphragm spring action.

WHEN IT'S
Special BOLTS
and STUDS
Send your Specifications to
ERIE
37 years' experience in making special bolts, studs, nuts for specific job requirements.

Specialists in Precision High Quality
ALLOY STUDS

ERIE BOLT & NUT CO.
ERIE • PA.
A SUBSIDIARY OF
Barium
STEEL CORPORATION
Steelwright to the Nation
STUDS • BOLTS • NUTS • ALLOYS

REPRESENTATION IN PRINCIPAL CITIES

New Cupcase Thermometer

A new cupcase thermometer, narrow enough to fit into 2-in. gauge pipes in oil storage tanks is announced

by Tagliabue Instruments Division, Weston Electrical Instrument Corporation, Newark, N. J.

Known as the TAG Model 8652, it meets ASTM specifications. It is designed for use in the oil industry where temperature is an important factor in determining the volume of oil at the time of sale. Since oil temperature varies from place to place within storage tanks, accurate temperature readings of the stored volume of petroleum are essential and can result in the saving of thousands of dollars yearly to both suppliers and buyers.

New Literature

Speed Reducer Catalog

A pocket-size catalog of speed reducers and right angle gear motors is announced for distribution by the Abart Gear & Machine Company.

The 96-page book gives complete engineering data on how to select the proper speed reducer to fit requirements, including horsepower ratings, ratios, and installation graphs. There is a photograph and a brief description of each unit.

Nordberg Bulletin

Design, operation and engineering data on the Nordberg Superairthermal engine are presented in a 12-page bulletin published by the Nordberg Manufacturing Company.

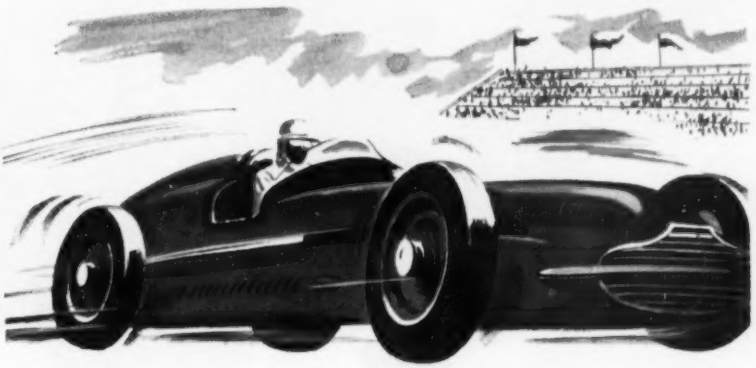
Bulletin 191 is illustrated by indicator diagrams and a comparison of the various piston strokes of a superairthermal and a conventional turbocharged engine. Actual comparative test data is given, plus diagrams of the more common types of cooling systems applicable to this engine. A nomogram is presented for determining the bmep. rating for the engine under typical operating conditions.

In addition, the new 2-color bulletin gives the models of the engine that are available in 4-cycle types for stationary and marine service in sizes from 425 to 3200 bhp. The engine is built for diesel, duafuel and spark-fired gas operation and the bulletin shows with installation photographs, some of its applications.

Degreaser Brochure

A new illustrated bulletin describing the company's line of degreasing equipment has recently been published by Phillips Manufacturing Company of Chicago. It gives a detailed picture of how degreasers operate, what types of manufacturing industries use them, and to what specific applications they can be put. The full line of vapor degreasers is shown along with the features, capacities and uses of each specific type unit.

There are a number of photographs showing industrial applications for both tank-type and conveyorized units,



Winners use MONMOUTH

MONMOUTH Thinwall Bearings are the choice of winners at the 500-mile Indianapolis Speedway Races.

In 1950, 8 of the first 10 cars to finish the race used Clevite 77 and Micro type Monmouth Engine Bearings.

In 1951, all 8 cars that finished the race used Clevite 77 and Micro type Monmouth Engine Bearings. The average speed of the winner was 126.244 miles per hour for the 500-mile race.

Monmouth Engine Bearings are designed and constructed, tailor-made if you please, for the work they have to do. This we call "Engineered Performance". It is just as important to Diesel engine performance as in a Speedway race car. It is a quality found in no other engine bearing. In the maintenance of Diesel engines — whether marine, stationary, or in prime movers — specify Monmouth Engineered Bearings.

All Monmouth Replacement Parts are engineered and precision made to safeguard the reputation of the master Diesel engine mechanics and insure user safety and satisfaction.

THE CLEVELAND GRAPHITE BRONZE CO.
REPLACEMENT SALES DIVISION
6545 Carnegie Ave. • Cleveland 3, Ohio

WHEN THE JOB HAS GOT TO BE
RIGHT!

Snap-on*
TORQOMETERS
assure Precision Tensioning

It doesn't take a man one second longer to snug down a nut to exact tightness of factory specifications, with a Snap-on Torqometer. Sturdy, accurate Torqometers can easily pay for themselves by saving *just one critical assembling job* from "going bad" when it gets back in service. Even the most skilled mechanics can't be expected to approximate specified bolt tension "by feel." But with Snap-on Torqometers, the exact tension can be applied with ease. Torqometers are available in 15 models, ranging from zero to 30 inch-pounds, up to 2000 foot-pounds torque capacity. Factory branch offices and warehouses in 41 important industrial centers. Write for special Industrial and big General Catalogs.

Snap-on Tools
THE CHOICE OF BETTER MECHANICS

SNAP-ON TOOLS CORPORATION
INDUSTRIAL DIVISION
8064-J 28th Avenue, Kenosha, Wis.

*Snap-on is the trademark of Snap-on Tools Corporation

and the degreasing process itself is explained for the benefit of those who may not be completely familiar with it.

Compressor Catalog

Recently announced by the Quincy Compressor Company is a new 12-page catalog, Form 300, featuring their line of air compressors specifically designed for industrial service.

This catalog, designed in two colors, presents a complete study, by means of illustrations, drawings and specifications of the 35 air-cooled compressors generally recommended for industrial use. The company manufactures air compressors exclusively in a wide variety of sizes and types ranging from 1 to 90 cfm.

Scrap Booklet

Aimed to help increase the current dangerously low iron and steel scrap inventories in this country, the National Production Authority, U. S. Department of Commerce, is distributing a booklet, "Scrap for Steel Mills and Foundries for Defense," to more than 200,000 executives of business, industry and trade associations.

The booklet emphasizes that record-breaking steel production and large scale expansion of production capacity has reduced scrap inventories of mills and foundries to a new all-time low, with some plants having only a few days scrap supply on hand. If the nation is to achieve its 1951 goal of 110,000,000 tons of steel ingots and castings, 36,000,000 tons of heavy industrial scrap must be found, the booklet says. A four point program is outlined for the recovery of dormant scrap.

Swartwout Bulletin

A new 12-page bulletin describing in condensed form the complete line of power plant equipment, is announced by The Swartwout Company.

Printed in two colors and punched to fit 3-ring binders, the catalog is profusely illustrated with photographs, flow diagrams, dimensional drawings, performance charts and specification tables. It described the line of control valves, pressure master controls,

desuperheaters, temperature master controls, water regulating valves, liquid level and drainage controls, differential pressure controls, feed water heaters, feed water regulators, separators, exhaust heads, air separators, and other accessories. It also lists company representatives throughout the United States.

GMC Trucking Brochure

General Motors Corporation Truck & Coach Division has recently issued a brochure to be distributed by dealers.

This leaflet tells the story of a trucking company in the Southwest that had used GMC diesel trucks since 1939 and reports that each of its original eight models traveled approximately one million miles.

Power "Facts" Book

A "Facts" book has been produced by the BFM Industries, Inc. to acquaint industry with their techniques in rebuilding and remodelling power equipment.

Using a photo-narrative style, the book takes the reader on a typical problem tour of the plant, describing the methods developed whereby diesels, generators and motors are stripped to the original cast and then rebuilt or redesigned for special need. Departments covered include engine remodeling and rebuilding, machining and testing, electrical fabricating, and ship repair and conversion facilities.

Hydraulic Valve Catalog

138 different models of hydraulic valves, each in varying sizes, are illustrated and described in a new Rivett catalog section No. 203, recently published by Rivett Lathe & Grinder, Inc.

The 28 page, 3 color book furnishes working drawings and specifications for each model and size valve. Also shown are cut-away views for each series and operational diagrams of the five piston designs.

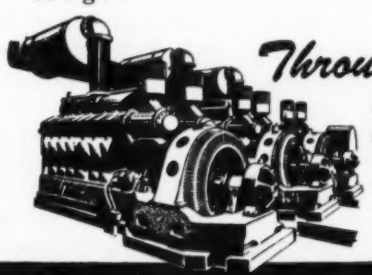
The catalog describes 25 models of oil pilot valves for remote control of main 4-way valves. Valves for flow control, shut-off and deceleration, relief, sequence, unloading and counterbalance are likewise shown.

ASK THE AEROFIN MAN

For the Practical Answer to Your Heat-Exchange Problem . . .

There is a competent Aerofin heat-transfer engineer near you, qualified by intensive training and long experience to find the *right* answer to your own particular heat-exchange problem.

This specialized knowledge is there, ready for you to use to your greatest advantage. Ask the Aerofin man — and be right.



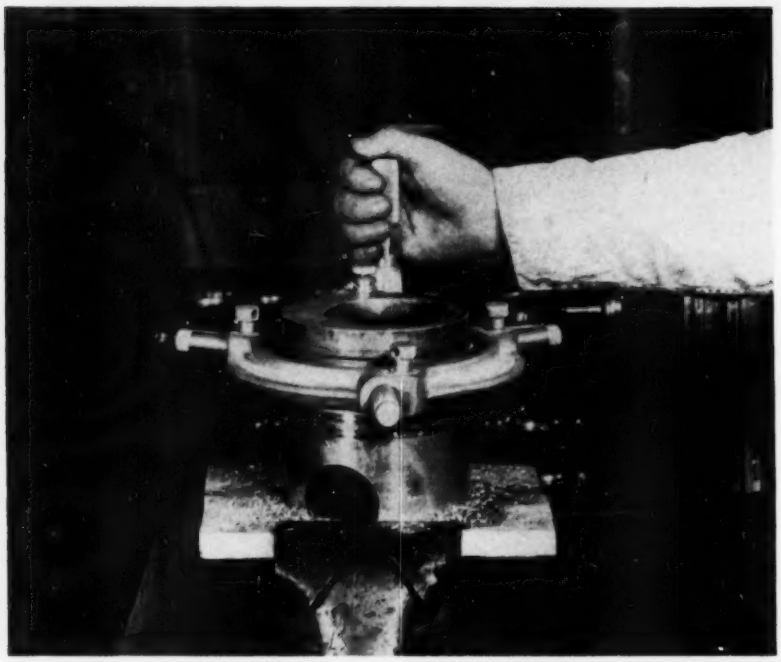
Throughout the Power Industry—

Aerofin units do the job Better, Faster, Cheaper

AEROFIN CORPORATION 410 South Geddes St. Syracuse 1, N. Y.

Aerofin is sold only by manufacturers of nationally advertised fan system apparatus. List on request.

Field Notes



Tool for Salvaging Pistons

With material for new machines and replacement parts in short supply, practical methods for prolonging the life of parts to keep machines operating are becoming extremely important.

To this end the Caterpillar Tractor Company has developed a tool known as the "Manulathe" for remachining the top ring groove on pistons. This is the point of greatest wear on pistons, and if the part is otherwise sound, many additional hours of life can be obtained from the piston by remachining.

Wide piston rings are now available for all Caterpillar diesel engines with the exception of the high output V-type engines, for which the company does not recommend regrooving of pistons.

The "Manulathe" provides a very accurate and fast method of regrooving pistons. It will produce results equal to those obtainable on the best engine lathe, and is equally adaptable to all-aluminum as well as cast iron insert type pistons.

The tool consists of a cast ring with three locating pins and a carboloy cutting tool. The cutting edge is fed into the work with each revolution of the "Manulathe" about the piston. Since the tool is accurately located on the piston and rate of feed is constant, very precise results are obtained.

DEMA Educational Conferences

Diesel Engine Manufacturers Association is holding a series of regional meetings for college professors. The purpose of these meetings is to give professors teaching diesel engine courses material that will make them better teachers. Anyone wishing to attend should notify DEMA's headquarters at once so that adequate facilities will be set up. The meetings are scheduled as follows: Buffalo, October 9, Worthington Pump and Machinery Corp., Cleveland, October 16, Aluminum Company of America; Chicago, October 30, breakfast, "Harlequin room", Fred Harvey Restaurant, Palmolive Bldg., for professors attending the SAE Diesel Meeting; Denver, November 3, University of Denver; Oakland, Calif., November 6, Winslow Engineering Co.; Philadelphia, November 8, Wilkening Mfg. Co.; Los Angeles, November 8, Farr Co., Inc.; Meriden, Conn., November 13, The Cuno Engineering Co.

Diesel Powerplant Conference

The second annual conference for diesel powerplant operators, engineers, and superintendents will be held at the University of Missouri, Columbia, Mo., for three days beginning October 22.

Experts from the diesel industry and faculty members will lead discussions on engine problems including crankcase explosions, dual fuel and engine-water treatment, lubrication, and filter problems, and preventive maintenance for engines and electrical gear. A half-day session will be devoted to a fuel injection equipment servicing clinic with actual bench teardown demonstrations. All sessions will be concerned with the practical aspects of operation and maintenance.

Registration fee for the meeting is $5.00. Applications for registration should be sent to Prof. R. T. Quick, Engineering Bldg., University of Missouri, Columbia, Mo.

Zollner Gets Al-Fin License For Bi-Metallic Pistons

A license for the manufacture of molecular bonded by-metallic pistons has been granted by the Al-Fin Division of the Fairchild Engine and Airplane Corporation to the Zollner Machine Works of Fort Wayne, Indiana. Under the terms of the license agreement, the Aluminum Company of America and the Bohn Aluminum and Brass Corporation will use the patented Al-Fin process in bonding and casting operations in production of piston castings for Zollner.

Zollner will provide by-metallic pistons for use as original equipment and for installation as replacements at time of overhaul for many of the

leading heavy-duty bus and truck engines, including diesel engines. Concurrent with entering the bi-metallic piston field, the firm is expanding its Fort Wayne plant to double its capacity.

Deep Rock Refinery

Construction has begun at Deep Rock Oil Corporation's Cushing refinery on a new blending and packaging plant for motor oils and greases.

Capacity of the new facility will be six million gallons annually, which represent roughly one-third of the Cushing refinery's output of lubricating oils. The other two-thirds is sold in tank car lots to industrial users and compounders throughout the country.

Solution Proposed to Northwest Power Shortage

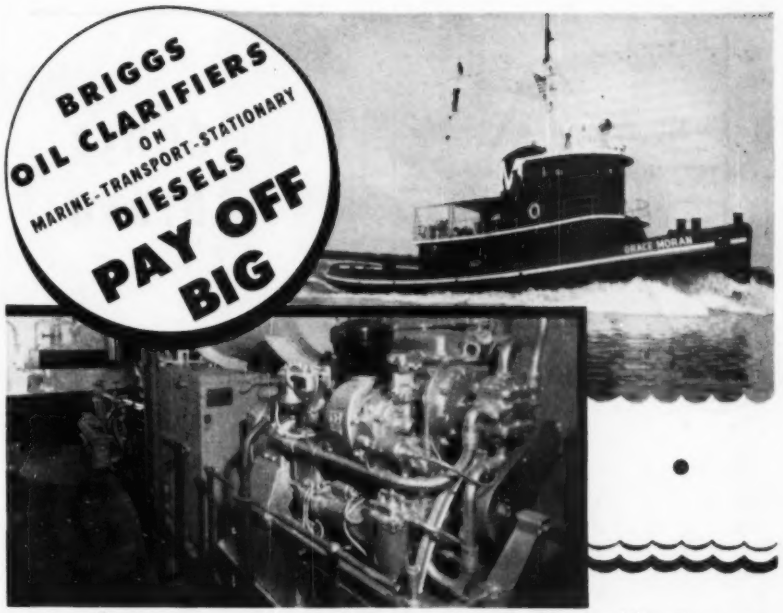
Due to the low water this year in the Northwest, it has been estimated that the region will suffer a power shortage of at least 300,000 kw. The load that will be curtailed will be the aluminum production. The Diesel Engine Manufacturers Association's answer to this problem was incorporated in a recent telegram to Charles E. Wilson, Director of Defense Mobilization. It reads:

"The diesel engine industry offers you its facilities to quickly and economically eliminate the power shortage reported in the Pacific Northwest. As you know, the diesel industry has built engines which now supply large segments of the aluminum industry with some of its cheapest and most reliable power and is now building hundreds of thousands of horsepower for new aluminum plants. Our industry has the plant facilities to furnish the necessary equipment to relieve in a short time the power plant shortage in the Northwest, which we understand is at least 300,000 kw. Our builders of this equipment stand ready to meet with you or anyone else at any time to discuss in detail what we can do to relieve this situation."

It is believed to be easier, quicker and cheaper to build diesel auxiliary plants in this region to take care of the shortage than it would be to move these existing plants to some other territory.

Henry J. Kaiser, industrialist, recently stated that "something drastic" should be done to restore aluminum production lines in the power-hungry Pacific Northwest. Two pot lines, each with an annual capacity of 22,000 tons of aluminum, have been shut down because of lack of power. He called for appointment of a single production man under Mr. Wilson to be responsible for the expansion of the industry to meet what he forecasted would be a continuously increasing demand.

Mr. Wilson met metals and power experts from the Department of the Interior and the Defense Production and National Production agencies to study reports from the Aluminum Company of America and the Reynolds Metals Company. It was understood that these producers agreed with Mr. Kaiser that moving pot lines from the Northwest would be costly and would cause further production stoppages in the course of moving, since the general shortage of electric power would necessitate construction of power sources wherever the industry was re-located.



. . . because they keep the lube oil clean— physically and chemically

THE GRACE MORAN

The "GRACE MORAN," other Moran tugs and many other vessels, power plants, railroads and transport lines have proved over the years that Briggs Oil Clarifiers improve engine performance by keeping lube oil clean.

BRIGGS offers the RIGHT FILTER for every diesel engine.

PROVE IT YOURSELF

Send us a sample of your oil and engine specifications. We will gladly make a laboratory test and give you our engineers' recommendation—no obligation, of course.

A Briggs Catalog belongs in your file—write for one NOW!

BRIGGS CLARIFIER—MODEL CD (Filter, Strainers and Oil Storage Tank—in one unit)

THE BRIGGS FILTRATION COMPANY
RIVER ROAD, WASHINGTON 16, D. C.

Briggs
PIONEERS IN MODERN OIL FILTRATION

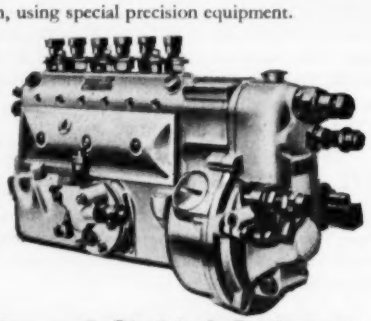
FOR MORE THAN A QUARTER CENTURY

Confidence Abroad

Transport operators all over the world have learnt to trust this sign.

In any language the letters on the C.A.V. sign stand for first-rate service facilities, maintained by highly-trained craftsmen, using special precision equipment.

Wherever vehicles fitted with C.A.V. Fuel Injection Equipment are exported — whether to Trondheim, Santiago, Hong-Kong or Sydney—there's a service agent or depot to give it the specialist attention needed for such high-precision equipment.



C.A.V.

Fuel Injection and Electrical Equipment

Service Depots throughout the World

C.A.V. DIVISION OF LUCAS ELECTRICAL SERVICES INC., NEW YORK 19, N.Y. Sales Office: 14820 DETROIT AVE., CLEVELAND 7, OHIO

New York Central Dieselization

The New York Central Railroad announced recently that it has placed orders for 261 units of diesel-electric motive power to cost approximately $35,000,000.

Of the total, 237 units are for New York Central service and 24 for its affiliated Pittsburgh & Lake Erie Railroad. The order consists of 64 road freight units, two road passenger units, 148 yard switchers and 47 road switchers.

Delivery of the new locomotives is expected to begin in the second quarter of next year and to be completed early in 1953. They will increase the diesel-electric ownership of the New York Central and affiliates to 1915 units with a total of 2,446,100 horsepower.

The locomotives will be constructed by the Electro-Motive Division of General Motors Corporation, the American Locomotive Company, Fairbanks, Morse & Company, and Baldwin-Lima-Hamilton Corporation.

(Continued on page 96)

Trouble Shooting

(Continued from page 74)

tions which will require the least amount of time and effort to check each item. I will not go into details of the investigation, but will give a brief outline.

1. Examination of fuel in float chamber of fuel pump will reveal if leakage is at injector seals or governor and fuel pump housing seal.

2. Examination of air receiver will determine if loss of oil is occurring through compressor. Examination of any other similar auxiliary equipment will also be necessary.

3. Removal of intake manifold will allow inspection to determine if oil is coming from (a) intake valve guides, (b) supercharger or (c) crankcase scavenging line. If evidence is found at this location, an examination of each of the three possible sources will determine which is responsible.

4. Removal of exhaust manifold will permit inspection for evidence of oil coming down exhaust valve guides.

5. The next step would be removal of pistons for examination of rings, combustion chamber and cylinder head. This is the last operation since it involves the most work and a good portion of preceding work is leading up to this operation anyway.

This analyzation of the problem and the sequence of the investigation is similar to that used in locating trouble in the fuel pump. I know that many of you know of instances where an engine has been completely disassembled because of oil consumption complaint and then the cause could not be found because the evidence was destroyed during the disassembling. In these instances, the mechanic is sure that "gremlins" have been drinking the oil, but to be sure, he rebuilds the engine with all new parts. This is expensive as well as costly in down time.

In conclusion, I wish to again define "Trouble Shooting" as nothing more or less than an organized study of the problem and a planned method of procedure for the investigation and correction of the difficulty. There is nothing mysterious or complicated about it—just organized thinking.

"pulse-measured" Diesels give...

MORE POWER, LESS WEAR

Results of Diesel "Full Load Test"*

Photo shows conditions at start of test (condition # 1)

Optimum injection and peak pressure timing for engine (condition # 4)

CONDITIONS	1	2	3	4	5
Start of Injection	29° BTC	26°	24°	23°	21°
Maximum H.P.	1048	1056	1073	1084	1026
Start of Combustion	12.5° BTC	7.5°	4°	3.5°	3°
Peak Pressure Location	8° ATC	10°	12°	12°	12°
Max. Firing Pressure	988PSI	923	872	860	835

NEW LINEAR

Pressuregraph

Completely re-engineered, it now offers a more accurate and detailed picture of the firing, of regular and instantaneous pressure variations . . . up to 200,000 separate pressures measurements per second.

MEASURES & RECORDS

Explosion, hydraulic gas or pressure in internal combustion or jet engines, injection pumps, pipe lines, compressors.

The **Linear Pressuregraph** provides linear stabilized measurement of pressure rise with time (vacuum to over 10,000 PSI), broad frequency response (zero to over 20,000 CPS). In addition, it offers these exclusive features: Greatly simplified pickup; temperature and drift compensated; permits up to 200' of pick-up cable to be used.

**Courtesy of Cooktite Ring Sales Co., Chicago*

Makers of The DYNAMIC MICROMETER

Electro ELECTRONIC EQUIPMENT

Measures dynamic or static displacement, vibration or movement of any metal body **without** physical contact.

Send for Detailed Bulletins Today!

ELECTRO PRODUCTS LABORATORIES

4505-LD NORTH RAVENSWOOD AVE., CHICAGO 40, ILL.

CRACKED

CRACKED AND DAMAGED DIESEL CYLINDER HEADS AND CYLINDER BLOCKS RESTORED LIKE NEW

The WELDIZE process is an outstanding achievement in rebuilding Diesel Cylinder Blocks and Diesel Cylinder Heads—whether small or large. We offer you our services which will save you money.

Our product and knowledge is backed up by thousands of satisfied operators throughout the country.

NOTE: We pay incoming freight from any part of the country. Write for complete details to:

WELDIZE CORPORATION • 236 HURON STREET BROOKLYN 22, N. Y.

order it . . .
install it . . .
forget it . . .

You can do that with ATLANTIC seamless diesel hose which requires no maintenance whatever.

Absolute uniformity of wall thickness . . . no seams or packed joints . . . absolutely tight against water, oil, steam, gas, air . . . dampens vibration . . . . maintains flexibility at extremely high temperatures.

Bronze, Steel, Stainless Steel, Monel — ⅛"—38" I.D. with fittings as needed.

Diesel Bulletins 1020 & 50A furnish complete information.

See our Catalog in Sweet's File for Product Designers.

ATLANTIC
METAL HOSE CO., INC.
109 West 64th St.,
New York 23, N. Y.

Consult ELLWOOD on all Your Forging Requirements

Quality Precision Crankshafts For Diesels — Since 1910 . . .

ELLWOOD CITY FORGE COMPANY
CRANKSHAFTS - CONNECTING RODS
MACHINE FORGINGS
ELLWOOD CITY, PENNA.

GM Diesel Delivered to Canadian Railway

General Motors Diesel, Ltd., has delivered a 1500-hp. locomotive to the Quebec North Shore and Labrador Railway which will service the rich Ungava iron ore country, scene of one of the world's biggest base metal developments.

It was the first motive power built for the newly incorporated Quebec North Shore. The general purpose unit of nearly 125 tons, as well as a 3000-hp. road freight multiple unit, for the Canadian National Railways left the London plant as the last of G. M. D.'s orders for its first 12 months of operations.

The year's output for the Canadian corporation was 137 locomotive units totalling 177,100 hp.

New Fram Plant

Fram Corporation, manufacturer of automotive oil filters, recently officially opened its million-dollar modern new filter plant at Greenville, Ohio, with a two-day open house for jobbers, distributors and auto manufacturers from 15 states, and for residents of Greenville and vicinity.

The new plant is 600 ft. long and 200 ft. wide, with a two-story center section of 30,000 sq. ft. The entire plant provides 150,000 sq. ft. of working space. It is constructed entirely of brick, steel and glass. When working at top production, the plant will employ 650 people and turn out 12,000 filters and 40,000 cartridges per day.

Locomotive Display

A locomotive display, aimed at boosting railroad traffic, was presented jointly by the American Locomotive and General Electric Companies at the September convention of the Allied Railway Supply Association, held in Chicago.

Stressed in the exhibit display were the Alco-GE motive power survey service and diesel-electric locomotive school courses offered to railroads. The school offers four scheduled courses, emphasizing practical training in the operation and maintenance of diesel-electric locomotives.

Look for the distinctive Lanova combustion chamber design in your next diesel — it's a sure guarantee of —

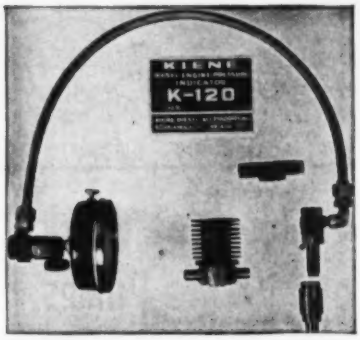
- High combustion efficiencies
- Topnotch operating economy
- Smooth, quiet operation
- Clean exhaust
- Easy starting

You'll find The Lanova System only in diesels manufactured by Lanova licensees. Their names will be furnished on request.

Lanova Corporation
38-19 30th St.
Long Island City 1, N. Y.

Lanova ...adopted and approved by leading diesel builders

KIENE MODEL K-120 UNIVERSAL PEAK PRESSURE INDICATOR



Model K-120 with cooler body and nozzle dummy.

MODEL K-120 Indicator has but one moving-part—nothing to wear or get out of adjustment.

VALVE—Gas trap type with diaphragm type check valve having adjustable lift. Stainless steel valve and seat.

No springs—No pistons—no complicated adjustments — No temperature corrections — no pressure loss in check valve.

GAGE READS TRUE PRESSURE—MAY BE RECALIBRATED ON ANY GAGE TESTER

Check readings can be made over and over again by releasing indicated pressures with bleeder valve.

GAGE—Hydraulic 3½ inch dead weight tested in suitable range to specification requirements.

ADAPTORS available for most models of engines manufactured in U.S.A. Other models made to order at reasonable prices.

For

Testing Firing and Compression Pressures on all Models of Diesel and Gas Engines.

Dependable — Easy to Use — Rugged. May be Used With or Without Flexible Tube.

DESCRIPTIVE BULLETINS AND PRICES FURNISHED ON REQUEST

Manufactured under patents No. 2280411, No. 2328325, others pending

KIENE DIESEL ACCESSORIES, INC.
10352 PACIFIC AVE., FRANKLIN PARK, ILLINOIS

GM Engineering Staff Buildings

Formal opening of the three engineering staff buildings at the General Motors Technical Center in Detroit recently marked the first major step in a project that began in 1945, when the corporation initiated their postwar program to embark on a new concept of industrial research.

The Technical Center is a regrouping of GM technical, research and styling facilities. At first the center was envisioned as a peacetime operation, but much of its work today is apportioned to national defense.

The actual building program was held up several years by postwar material shortages. Ground for engineering staff buliding finally was broken in 1949. The original Technical Center covered 320 acres. Additional property has been purchased until the entire area totals 813 acres.

The engineering staff, first major technical group to occupy the site, makes its facilities and services available to the corporation's various operating and manufacturing divisions. At the same time, it performs independent development work of its own —apart from services to the divisions.

In the Technical Center's operating pattern, engineering staffs occasionally take up where research laboratories leave off. Primarily, research laboratories develop principles that evolve into a "working sample". The engineering staff's function is to take over the working sample and develop it into a product acceptable to various production and manufacturing divisions.

In the independent development field, the engineering staff has five major groups under its command—car development, power development, structure and suspension development, transmission development and automotive ordnance.

New Chain Belt Sales Office

Chain Belt Company recently appointed the Gate Equipment Company as its new district sales office in the Salt Lake City area.

For the past 18 months Gate Equipment Company has served as a distributor for Rex and Baldwin-Rex chains and sprockets, Rex belt conveyor idlers and power transmission equipment. As a district sales office, it will continue to maintain its distributor status and carry stocks of these items for local service.

Oil Progress Week

Thousands of oil men are participating in the 1951 observance of Oil Progress Week, October 14-20. An array of speeches, radio interviews, television shows, community leader luncheon and dinners, public rallies, motion picture showings, exhibits displays, special advertising, parades, and other special events are scheduled. All emphasize the job oil has been doing, and the way it is handling the job ahead of keeping the American people well supplied with petroleum products.

Oil Progress Week is sponsored by the Oil Industry Committee of the American Petroleum Institute. This is the fourth observance. All events are conducted on a state, county or community basis by local oil men.

THIS PIPING MUST NOT BE SPRUNG — OR IT WILL BIND THE PUMP!
I'M MAKING SURE THE PIPING FITS THE UNION — I'LL PUT THIS SUPPORT UNDER THE PIPE TOO!

How to Get the Most Work Out of Your VIKING PUMPS

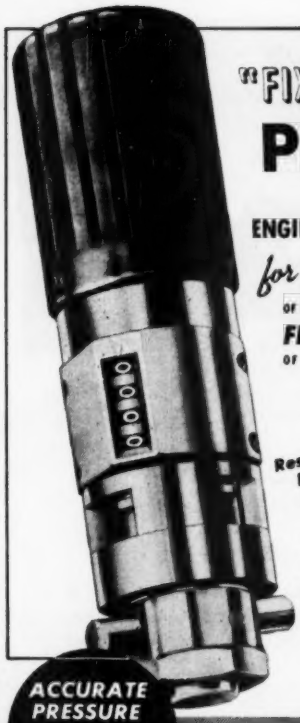
In making suction and discharge pipe connections on a Viking Rotary Pump be sure that no strain is imposed on the pump casing by the pipe. Properly installed, the shaft of a Viking pump should turn easily by hand. If this is not possible you have either sprung the pump in making the pipe connections or with the foundation bolts.

For valuable help in installing, operating and maintaining your pumps, write today for your FREE copy of the Viking Service Manual D. It's a handy, illustrated booklet filled with practical information. Get EXTRA wear out of your pumps by giving them EXTRA care. The Viking Service Manual D tells you how.

VIKING AN HONORED NAME IN PUMPING

See Our Catalog in SWEETS

Viking PUMP COMPANY Cedar Falls, Iowa



"FIXED-READING"

PREMAX

MODEL YRF

ENGINE PRESSURE INDICATOR

for DIRECT-READING OF COMPRESSION AND FIRING PRESSURES OF EVERY TYPE OF DIESEL ENGINE

ONE OF THE FEATURES Responsible for its Overwhelming Preference by Leading Diesel Manufacturers and Operators

Successive readings may be taken rapidly since no venting of the instrument is required between readings. No closing of valves required to change from firing pressure to compression pressure reading.

For other features, write for Bulletin 294

ACCURATE PRESSURE READINGS as high as 1700 P.S.I.

BACHARACH INDUSTRIAL INSTRUMENT CO. 7000 REBECCA STREET • PITTSBURGH 8, PA.

Lowell, Mich. Gets Tom Moore

Tom Moore, formerly chief engineer of the Freeport, N. Y. Municipal Power Plant, has resigned to take a similar position at Lowell, Michigan. Over four years ago, Mr. Moore was brought from Venezuela, where he was engaged in power plant activities, to improve operations at the Freeport plant.

Freeport was faced with ageing engines and a rapidly growing load. Existing engines were rehabilitated and a new Nordberg was installed. A good maintenance program assured ability to meet growing demands. A new Baldwin-Lima-Hamilton engine is on order, and, when installed, will provide adequate firm capacity.

Mr. Moore focused attention on the plant by incorporating "Vapor Phase" cooling on two Bush-Sulzer engines and by several other innovations. A member of the ASME Oil and Gas Power Division's Oil and Gas Power Cost Committee, Mr. Moore was in a position to compare the plant's efficiency with that of several others. It rated among the best.

At Lowell, Mich., Mr. Moore will supervise the utilities including a combination hydro and diesel power plant.

Worthington Exhibits

Welding positioners, turning rolls, and all-speed selectors are being exhibited by Worthington Pump and Machinery Corporation at the National Metal Exposition & Congress at the Michigan State Fair Grounds, Detroit, on October 15th through 19th.

Mr. J. F. Connolly, manager of the welding and assembly positioning equipment division will be in charge of the exhibit, to be held in booth No. 455, Building C. Also on hand will be members of the engineering and sales divisions.

Canadian Pacific Orders

The Canadian Pacific Railway Company has placed orders with Canadian companies for more than $50,000,000 worth of equipment to be delivered in 1952, it was announced recently. The orders placed were for 50 diesel-electric locomotives, 4250 freight cars and 50 units of head-end passenger equipment. Thirty-eight diesel locomotives are destined for use in completing the dieselization of freight and passenger service between Calgary and Revelstoke, over the steepest grades of the Rocky Mountains. Twenty-eight locomotives are already on order for this territory.

Of the new order, 12 units will come from the newly-established diesel plant of the Canadian Locomotive Company at Kingston, Ontario. Twenty 1500-hp. units will be delivered by General Motors Diesel, Ltd., at London, Ontario, as well as six streamlined "A" units, 11 "B" units and three road switchers.

Steel Castings Production Near Record High

Production of steel castings to meet expanding requirements of the defense mobilization program rapidly is nearing record proportions, it was reported recently during the annual meeting of Steel Founders' Society of America.

Despite manpower shortages and difficulties in securing adequate sup-

Have All Cylinders and Crankshafts Always **STANDARD SIZE!**

VAN DER HORST CORPORATION OF AMERICA • OLEAN, N. Y.
U. S. PATENTS 2,048,578, 2,314,604 and 2,412,698

PORUS - KROME VAN DER HORST
Good for the Life of your Engines

SAVE MONEY BY *KNOWING* WHEN TO OVERHAUL YOUR DIESELS

KIENE DIESEL INDICATOR will tell you Compression and Firing Pressures ...FAST

WHY GAMBLE?

With the KIENE DIESEL PRESSURE INDICATOR, you waste no money on costly overhauls done too soon—take no risk of putting off overhauls until too late.

The KIENE INDICATOR tells, reliably by accurate measurement of compression and firing pressures, when your engine needs attention.

SIMPLE—no complicated adjustments. **RELIABLE**—not affected by heat. **ACCURATE**—effects of friction and inertia eliminated. **RUGGED**—only one moving part. **COMPACT**—weighs less than ten pounds.

LOW IN COST—For full details, send for Bulletin K-100.

KIENE DIESEL ACCESSORIES, INC.
10352 PACIFIC AVE., FRANKLIN PARK, ILLINOIS

plies of necessary scrap and other raw materials, the steel castings industry now is producing at a rate rapidly approaching the all time high of 1944, during World War II, when the industry shipped 2,445,421 tons. Currently the country's 250 steel foundries are operating at a level more than 150 per cent above 1950 and are producing at a rate in excess of 2,200,000 tons yearly, according to official Bureau of the Census figures. This compares to shipments totaling 1,461,667 tons in 1950.

Detroit Diesel Expansion

A million dollar building expansion program to increase production facilities of the Detroit Diesel Engine Division of General Motors has been announced recently. This is the eighth major expansion of the Division and adds almost 80,000 sq. ft. to the million sq. ft. now under cover.

A production figure of over 50,000,000 hp. in 2-cycle diesel engines has been attained by the Division since 1938.

"Cat" Metallurgist Chosen

Glen C. Riegel, chief metallurgist of the Caterpillar Tractor Company, has been named by the American Society for Metals to lead foreign and American experts in technical sessions at the World Metallurgical Congress in Detroit on October 14-19.

The Illinois metallurgist is noted for his development of new steel hardening methods. His process of heat applications to metals has cut expensive alloy content in steel and has revolutionized the manufacture of large gears for heavy machinery.

Truck Tax

The New York State Tax Commission recently announced that 15,858 motor carriers have filed applications with the State Truck Mileage Tax Bureau for highway use permits and plates under the State's new truck mileage tax law. The applications cover 85,251 vehicles. The new bureau has already banked receipts totalling $263,415. There is a permit fee of $5 per vehicle.

Trucks, tractors, trailers and other vehicles subject to the new truck tax law must have highway use permits and plates in order to legally operate on streets and highways of the State after September 30. Affected are all vehicles which, alone or in combination with other vehicles, have a maximum gross weight over 18,000 lbs. The Tax Commission has estimated that about 150,000 vehicles of 35,000 New York and out-of-state carriers will be subject to the new law.

Operation of an affected vehicle without a permit and plate is a misdemeanor, punishable on first conviction by a fine of not less than $100, not more than $250, and on second or subsequent convictions by a fine of not less than $250, not more than $500, or by imprisonment for not more than ten days. The law makes no provision for an extension of time for compliance with permit and plate requirements. Its provisions became fully operative October 1.

The first monthly mileage tax returns will be due on or before No-

vember 20, covering operations in October. Rates, graduated according to weight, range from 6/10th of one cent per mile for vehicles having a maximum gross weight of 18,001 to 20,000 lbs., up to 2.4 cents per mile for vehicles having a maximum weight over 62,000 lbs.

Welding Clinic

A three-day welding clinic was held recently by the Whitehead Metal Products Company, Inc., of Buffalo.

Demonstrations were given of various types of welding by technicians from various companies, and there were open forum discussions.

Organizational News

Westinghouse Promotions

C. W. Miller has been named manager of large power transformer engineering for the Transformer Division of the Westinghouse Electric Corporation at Sharon, Pa. He succeeds the late W. G. James, who died unexpectedly on August 10. He was formerly section manager in charge of the shell form section.

Robert R. Longwell has been appointed Baltimore engineering and service manager. He was formerly engineering and service supervisor in the Baltimore office.

George E. Grosser has been appointed district consulting and application engineering supervisor, with headquarters at Philadelphia. He has held the position of switch gear specialist since 1939.

Union Carbide Appoints

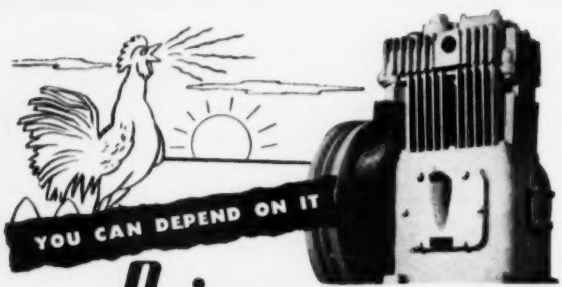
The appointment of Dr. James F. Eversole as manager of research administration of Union Carbide and Carbon Corportion has been announced recently. He will help coordinate the research activities of all the corporation laboratories where basic research and development work is being done on alloys, chemicals, gases, carbons, and plastics.

Dr. Eversole joined the chemical research organization of the corporation as a research chemist in 1929. Several years later he was assigned to the laboratories of Linde Air Products, a division of the corporation. In 1944, he was appointed superintendent of Linde's laboratories at Tonawanda, New York, a position he has held until his present appointment.

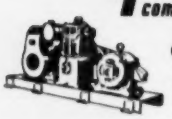
Purolater Appointments

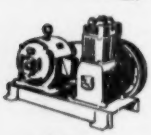
Frederick P. Babcock has recently been appointed permanent Washington representative for Purolater Products, Inc. Formerly assistant sales manager in charge of aviation, export and government equipment sales, he joined the company in 1937 after technical work with the Stanavo Division of Standard of New Jersey, and sales managership of the New Brunswick, N. J. bulk plant.

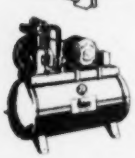
Stephen W. Bumball was recently transferred to the equipment sales department and appointed sales engineer to handle details of the aviation, export, and government trade. As payroll supervisor, he also joined the company in 1937 and subsequently has served as auditor and credit manager.



Quincy COMPRESSORS FOR DEPENDABLE COMPRESSED AIR SUPPLY







You can count on the steady performance of Quincy Compressors. Modern . . . compact . . . rugged in construction, Quincy Compressors are available in a wide variety of sizes ranging from 1 to 90 c.f.m. Depend on a Quincy specialist to help you select the type and size compressor to meet your needs. Write Dept. J-21 for details and prices.

ONLY Quincy OFFERS ALL THESE FEATURES

- Timken Bearings
- Lynite Rods
- Perfectly Balanced Crankshaft
- Copper-Finned Intercooler
- Automatic and Positive Lubrication

QUINCY COMPRESSOR CO. QUINCY, ILLINOIS

Branch Offices: New York • Philadelphia • Chicago • St. Louis Dallas • San Francisco

TAC does what no other tool can do!

AT LAST! AN OPEN-END RATCHET WRENCH — the world's first true *universal* wrench. A patented design for connections on tubing, rods, piping, conduit, studs, etc. Sixty-four socket sizes from 3/8" to 4". Smallest effective ratcheting arc yet — 5° to 7½°. TAC will also do every job any ordinary ratchet wrench will do: one TAC set replaces literally dozens of single-purpose hand tools.

makers of advanced tools for industry

TAC

TAC is the registered trademark of

TUBING APPLIANCE CO.

7112 South Victoria • 10321 Anza Ave. • Los Angeles, Calif.

PROVIDING THE FASTEST, MOST ECONOMICAL METHOD KNOWN FOR CONNECTING AND DISCONNECTING PRESSURIZED FLUID-CARRYING LINES

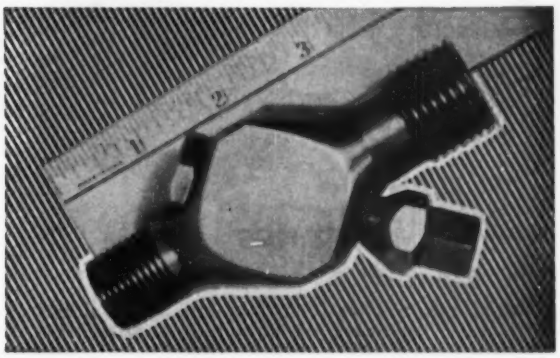
Aeroquip

SELF-SEALING COUPLINGS

AEROQUIP CORPORATION
JACKSON, MICHIGAN

FLEXIBLE HOSE LINES; DETACHABLE, REUSABLE FITTINGS; SELF-SEALING COUPLINGS; "BREAKAWAY"; HYDRAULISCOPE

KIENE®
DIESEL INDICATING VALVES



KIENE VALVES are designed to give good service under most severe conditions. WILL NOT BLOW OPEN, as valve opens against pressure. The KIENE VALVE HAS EFFECTIVE GAS SEAL when opened or closed, without use of packing or glands.

The KIENE VALVE is SMALL AND RUGGED, 4¼" in length and requiring only 3¼" circle of space for attachment. Has been operated at pressures up to 10,000 psi.

ALL KIENE VALVES have standard indicator plug and wing nut connection. Regularly furnished with male ½" NPT engine connection. Other threads furnished on order. Special adaptions for most Diesel locomotive engines.

KIENE DIESEL ACCESSORIES, INC.
10352 PACIFIC AVE., FRANKLIN PARK, ILLINOIS

Allis-Chalmers Executives

At a recent meeting of the board of directors of Allis-Chalmers Manufacturing Company five new officers were elected.

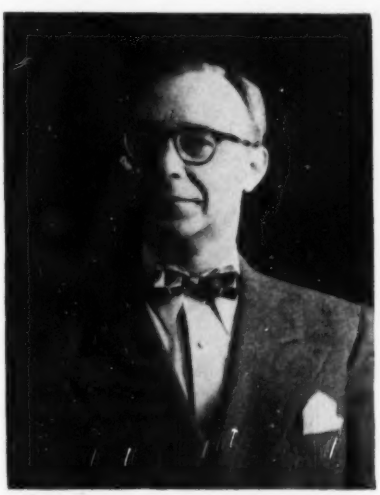
W. G. School, general sales manager of the tractor division, was named vice president in charge of sales for this division, and C. W. Schweers, director of sales in the general machinery division was named vice president in charge of sales for his division.

J. F. Roberts, director of engineering in the general machinery division, was named vice president in charge of engineering for the general machinery division, and W. A. Yost, manager of the mechanical power department, was named a vice president of the general machinery division.

G. F. Langenoh, assistant treasurer, was elected to the position of treasurer and appointed assistant secretary. N. D. Johnson, assistant secretary, will continue to serve in that capacity and assume additional responsibilities as assistant treasurer.

Budd Executive Addresses Conference

Dr. Michael J. Watter, head of the



manufacturing methods research division of The Budd Company, Philadelphia, was one of the three United States scientists of the twenty from all over the world invited to address the 1951 Design Congress at the Royal Academy of Design in London on September 19. All speakers talked on the topic, "Design Policy as the Responsibility of High Level Management."

General Electric Appoints

Three appointments in the purchasing section of the General Electric Materials and Purchasing Department were announced recently.

Vincent P. Gregg is the new manager of purchasing of nonferrous materials. He joined the company in 1945 as a student engineer on the test course, and a year later was placed in charge of test engineering activities at Lynn River Works. Subsequent arsignments at the Schenectady Works included technical personnel placements and sales training, and buyer, assistant purchasing agent, and purchasing agent in the former purchasing department.

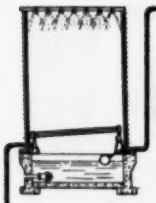
Bruce H. Bradbeer has been named manager of purchasing of ferrous materials. A graduate of Rice Institute with a B. S. degree in electrical engineering in 1946, he joined the company that year as a student engineer

Rotary Geared Pumps WITH INTEGRAL FLANGE MOUNTINGS

Here's a line of pumps that simplifies installation problems in diesel lubrication or fuel transfer. Brown & Sharpe Rotary Geared Pumps Nos. 1, 2, 3, 4, 1S, 2S, and 3S can be furnished with flange mountings for practically any mounting condition. They are especially useful where it is desired that the pump be an integral part of the engine or machine. Write for complete catalog or details on how these pumps may be used to solve your special problem. Brown & Sharpe Mfg. Co., Providence 1, R.I., U.S.A.

We urge buying through the Distributor

BROWN & SHARPE MFG. CO.



Binks closed-type

DIESEL COOLING SYSTEMS

produce higher engine efficiency

Diesel engines may be operated at higher, more efficient temperatures with Binks Type "D" evaporative heat exchange coils, installed in a Binks natural or mechanical draft cooling tower. The Binks system is a closed one in which treated or soft water can economically be used for cooling purposes. Scale formation in jackets is eliminated. Exact temperature control is obtained. Diesel "down time" is cut. Breakdown insurance rates are lower.

SEND for Bulletin 41. Obtain full information—drawings, tables—on heat exchange coils adaptable to a variety of operating conditions.

Binks MANUFACTURING COMPANY
3114-38 Carroll Avenue
Chicago 12, Illinois

REPRESENTATIVES IN ALL PRINCIPAL CITIES

on the test course. In 1948 he became a buyer in the former purchasing department, the position he has held until now.

Herbert L. Schnell is the new manager of purchasing of factory equipment and subcontracting. He joined the company in 1947 as manufacturing consultant for the executive department and was named purchasing agent in the former purchasing department in 1949.

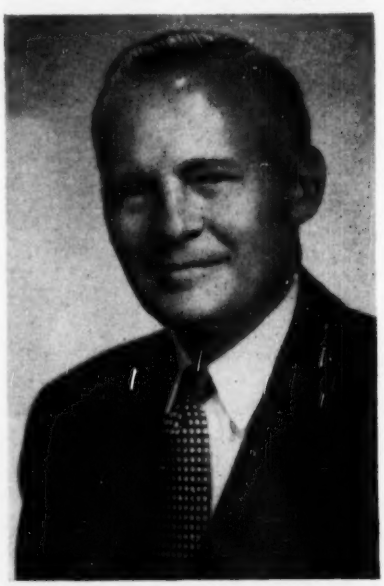
Bendix-Westinghouse Manager

Announcement was made recently of the appointment of Paul E. Friend as the New York regional manager of the Bendix-Westinghouse Automotive Air Brake Company.

Friend is a mechanical engineering graduate of Purdue University and has been assistant regional manager of the New York office for the last 3 years. He joined the firm as a sales engineer in 1946 following 4 years service as a lieutenant in the Navy. He is a member of the Society of Automotive Engineers and the American Ordnance Association.

Elliott Change

A. P. Wendland has been appointed



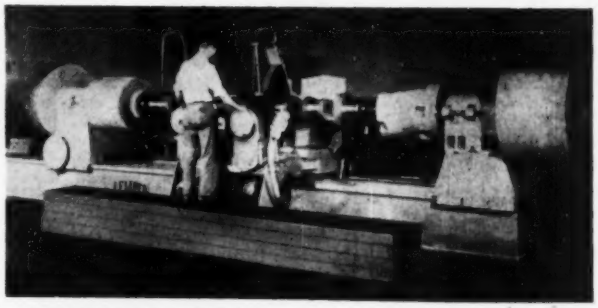
manager of the general service department of the Elliott Company, with headquarters at Jeanette, Pa. He succeeds the late Frank Murphy.

Mr. Wendland came with the company in 1925, having been graduated in mechanical engineering from Oregon State College. He was assigned as a field engineer to the Philadelphia office after completing his apprentice course. From 1942 to 1943 he served as assistant to the director of research and development in Jeannette. In 1943 he established the Wilmington, Delaware district office, and for the past year had been manager of mechanical sales of the Philadelphia office. For many years he had also been in charge of Elliott resident service personnel in the Philadelphia area.

Aeroquip Elects

The board of directors of Aeroquip Corporation recently elected two new vice presidents.

Benjamin A. Main, Jr., vice president in charge of engineering, has been with the corporation since 1942



BRODIE SYSTEM
AN ENGINEERING SERVICE

Recent installation of the NEWEST and LARGEST crankshaft grinder in a jobbing shop.

Complete facilities for all types of diesel engine repairs including metallizing, welding and machine shop service. Reconditioning of large crankshafts our specialty.

BRODIE SYSTEM

115 Clifton Place,
Brooklyn 5, N. Y.
Phone Main 2-5242

as chief development engineer. A graudate of special courses at the University of Michigan, he is a member of the Society of Automotive Engineers.

H. L. Schrock, Jr., vice president and treasurer, has been with the company since 1947. A graduate of Northwestern University, he was formerly with Ernst & Ernst, certified public accountants.

Cleveland Graphite Bronze Appoints

Appointment of John F. Moriarty to the newly-created position of sales promotion manager of the replacement sales division of The Cleveland Graphite Bronze Company was announced recently.

Advertising, sales promotion, product publicity and display for the division will be responsibilities of Mr. Moriarty, who has been with B. F. Goodrich Chemical Company in Cleveland in various advertising and public relations staff capacities.

American Brake Shoe Vice President

Eads Johnson, Jr. has been appointed executive vice president of the Southern Wheel Division, American Brake Shoe Company. He was formerly assistant vice president.

Mr. Johnson started with the company in 1934, after his graduation from Yale University. He entered sales work for the Brake Shoe & Castings Division in 1935. In 1949 he transferred to the sales department of the Southern Wheel Division and in 1950 became assistant vice-president of that division.

Worthington Sales Consultant

Charles Ebem Wilson, sales vice president of the Worthington Pump and Machinery Corporation, has been appointed a West Coast consultant on sales problems recently.

In 1946 Mr. Wilson, in addition to his other duties, was made president of the Worthington-Gamon Meter Corporation, then a subsidiary. He will retire from his present position and activities in corporation affairs effective October 1st, but will continue in a consulting capacity on sales prob-

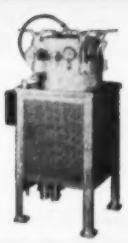
HILCO LUBE AND FUEL OIL PURIFICATION FOR DIESEL AND GAS ENGINES . . .

PURIFIERS · FILTERS · RECLAIMERS · CONDITIONERS

THERE'S A HILCO FOR EVERY LUBRICATION AND FUEL OIL FILTERING PROBLEM . . .

YOU WANT CLEAN OIL AND CLEAN ENGINES TO SAVE EQUIPMENT - OIL AND MONEY - INVESTIGATE HILCO OIL MAINTENANCE METHODS

★ *WRITE FOR FREE LITERATURE - NO OBLIGATION*



• THE HILLIARD CORPORATION, 120 W. FOURTH ST., ELMIRA, N. Y. •

IN CANADA — UPTON-BRADEEN-JAMES, LTD. — 990 BAY STREET, TORONTO, 3464 PARK AVE., MONTREAL

HAVE YOU A JOB FOR A TRAINED MECHANIC?

We have a number of alert young men who have completed intensive training in Diesel Mechanics. They learned their trades thoroughly by working on actual equipment under personal, expert supervision. If you need a trained man, we invite you to write for an outline of our course, and for a prospectus of the graduate. No fees, of course. Address:

Placement Manager, Dept. P-103-10

COMMERCIAL TRADES INSTITUTE
1400 Greenleaf Chicago 26

HEAT EXCHANGERS — LUBE OIL COOLERS
ROSS Type "BCF"
"YOUNG" RADIATORS 42" x 65"
UNUSED SURPLUS
In stock — Ready to Ship
ALJON ELECTRIC DIESEL CO.
904 Pacific St. Brooklyn 16, N. Y.
STerling 3-6515

Diesel Engine Salesman

Experienced industrial and construction machinery salesman with executive ability desires sales position with a manufacturer of diesel engines or diesel powered machinery. Graduate of eastern college, licensed diesel engineer, experienced in marine and industrial diesel power, worked foreign construction as diesel mechanic foreman, five years construction machinery sales experience for one of nation major distributors. Unmarried, young, willing to travel. Outstanding diesel engine sales record with a major manufacturer. Only a top sales position will be considered. Write to Box 901, Diesel Publications, Inc., 192 Lexington Avenue, New York 16, New York.

lems at Worthington's offices in Los Angeles, San Francisco, Seattle and Salt Lake City.

A veteran of 59 years' service with the corporation, Wilson started as an office boy in 1892. He soon became a sales representative and in 1905 he was named manager of the Chicago sales territory. He was transferred to the export division of the New York office as assistant general sales manager in 1918. He later served as general sales manager from 1923 to 1932. In 1932 he was elected a vice president, serving from 1934 through 1940 at Los Angeles and recently in the New York and Harrison offices.

Mr. Wilson will continue on the board of directors of Wintroath Pumps, Inc., a wholly owned subsidiary, whose main offices are at Alhambra, California.

Sealed Power Changes

The appointment of Robert B. Hawkins as manager of the Detroit office of the Sealed Power Corporation was announced recently. He replaced E. C. Beck, who has been assigned to special duties in the Muskegon office.

With the company since 1940, Mr. Hawkins has been assigned to sales engineering work since 1942 in Rochester, Detroit and Muskegon. He also served two years on the engineering staff in Muskegon.

Also announced was the assignment of William Van Dam to the Detroit sales engineering staff. He has been with the company since 1938, and has been doing sales engineering work since June, 1950.

SURPLUS

GM 6-71 ENGINES

FOR INDUSTRIAL USE

- **QUADS**
- **TWINS**
- **SINGLES**

ALSO ADAPTABLE FOR TRUCKS AND BUSES

600 HP — 3.23:1 REDUCTION GEAR

WRITE — WIRE — PHONE NOW!

DIESEL DIVISION
NATIONAL METAL & STEEL CORP.
Dept 26, Terminal Island (Los Angeles Harbor), Calif.
TELEPHONE—LOS ANGELES: NEVADA 6-2517

Specify

COLUMBIA

A. C. and D. C. GENERATORS

- For Coupled Service
- For Belt Drive
- Single or Two Bearing

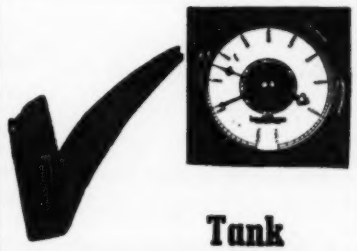
Columbia, with its years of experience, brings to generator set assemblers a wide line of performance proved, sturdily built, A. C. and D. C. Generators.

AC Generators: 6¼ to 1000 KVA
DC Generators and Exciters: 2 to 300 KW

•

Write for information. Our Engineers will be glad to review your requirements.

COLUMBIA ELECTRIC MFG. CO.
4537 Hamilton Ave. Cleveland 14, Ohio



Tank Contents At A Glance

With Liquidometer remote reading fuel storage tank gauges you can check quickly and accurately oil deliveries, consumption and amount on hand. No Diesel plant is complete without one. Liquidometer or Levelometer models are available for tanks of any capacity.

Write for complete information

THE LIQUIDOMETER CORP.

36-24 Skillman Ave., Long Island City, N. Y.

LUBAL Diesel Additives Prolong Engine Life

SAVE FUEL & LUBE OIL

Write for Bulletin

LUBAL, INC.

375 W. Rich St. Columbus 8, Ohio

PIONEERS IN DIESEL TESTING EQUIPMENT

For Additional Information Write

AUTOMOTIVE PRODUCTS, INC

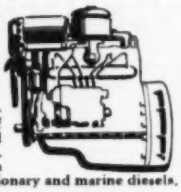
1700 Southeast Grand Avenue
Portland 14, Oregon

DIESEL ELECTRIC GENERATING PLANT

For sale alternating current Diesel Electric generating plant used not more than 10 years. Complete with 2 Worthington engine generators, each engine rated 125 HP with direct connected generators, belt driven exciters, intake silencers, cooling system, water recirculatory pumps, gages, fans, fuel oil system with pumps, automatic controls and alarm, switchboard with oil circuit breakers and voltage regulators. Plant is in N.Y.C. and is offered as is — where is.

Write to Box 900, Diesel Publications, Inc., 192 Lexington Ave., New York 16, N. Y.

SURPLUS DIESELS



Stationary and marine engines of various sizes and makes available. Large selection spare parts for stationary and marine diesels.

We can save you money and make prompt delivery.

E. R. SMITH

2637 El Segundo, Compton, Calif.
Phone: NEvada 6-1505

Weatherhead Chief Engineer

B. R. Teree has recently returned to The Weatherhead Company as chief engineer of the Aviation Division. His former association with the company began in 1946 in the capacity of project engineer and he was later advanced to director of laboratories and engineering manager.

Mr. Teree is a graduate of the University of Michigan, and was associated 15 years with the Curtiss-Wright Corporation. In 1946 he resigned his position of assistant chief of the structures department to join the Weatherhead staff. Most recently, he has been director of engineering for the hydraulic division of The New York Air Brake Company at Watertown, New York.

Honeywell Managers

New industrial managers have been named for the Denver, Tulsa and Kansas City branch offices of Minneapolis-Honeywell Regulator Company, it was announced recently.

W. J. Blackburn has been made industrial manager of the Denver office, succeeding Donald W. Larcen, who was recalled to active military duty.

Donald D. Baker has been made industrial manager of the Kansas City office, succeeding Blackburn. Baker, formerly at Wichita, has been replaced there by Bernard J. Alberts from New Orleans.

Jack F. Smith has been appointed industrial manager at Tulsa, from which city he will coordinate the company's industrial sales activities in the Tulsa, Oklahoma City and Amarillo areas under the direction of the branch manager. Pilgrim McRaven will handle industrial interests in Oklahoma City.

Authorized Sales and Service
Robert Bosch, Bendix-Scintilla and Demco.

Now available for immediate delivery ROBERT BOSCH pintle and hole type nozzles.

A & D Diesel Service, Inc.
677 Fourth Avenue
Brooklyn 32, New York

They're Ready Now To Fill Your Needs For

Trained DIESEL MEN!

UEI graduates are energetic, willing workers. They have good basic training in operation, maintenance and repair of all types of Diesel engines. The Diesel man you want is ready to go to work for you in the U.S. or Canada, or will travel farther if the opportunity is right. Tell us your needs.

WRITE TODAY

UTILITIES ENGINEERING INSTITUTE

DIESEL DIVISION

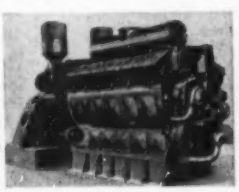
"Training Men for Industry Since 1927"

2523 Sheffield Ave.
Chicago 14, Ill.

DIESEL ELECTRIC POWER

for IMMEDIATE SHIPMENT

Unit Capacities 100 to 1875 Kva A.C. 50-60 Cycles Various Voltages



Write or wire today for bulletins and complete information regarding these fine fully guaranteed, low cost DIESEL ENGINE GENERATING UNITS. Visit our plants at Sausalito (S. F.), California, and Jersey City, N. J., and see units in operation on our test stand.

"SPECIALISTS IN DIESEL POWER"

A. G. Schoonmaker Co., Inc.

56 Church St., New York 7, N. Y.

ADVERTISERS' INDEX

A C Spark Plug Div., General Motors Corp. ***
A & D Diesel Service, Inc. 105
Aerofin Corp. 91
Aeroquip Corp. 101
Air Maze Corp. ***
Aljohn Electric Diesel Co. 104
American Air Filter Co., Inc. 29
American Bosch Corp. 5
American Brass Co. 35
American Diesel Service ***
American Locomotive Co. 43
American Motors Co. ***
Atlantic Metal Hose Co. 96
Automotive Products, Inc. 105

Bacharach Industrial Instrument Co., Inc. 98
Baldwin-Lima-Hamilton Corp. ***
Bendix Aviation Corp., Scintilla Magneto Div. 17
B. F. M. Industries, Inc. 40
Binks Mfg. Co. 102
Borg-Warner Corp., Rockford Clutch Div. ***
Boston Metals Co., The ***
Briggs Filtration Co., The 93
Brodie System 103
Brown & Sharpe Mfg. Co. 102
Buffalo Forge Co. 27
Burgess-Manning Co. ***
Burlington Instrument Co. ***

C. A. V., Ltd. 94
Chicago Cardboard Co. ***
Chicago Pneumatic Tool Co. ***
Cities Service Oil Co. 13
Cleveland Graphite Bronze Co. 89
Columbia Electric Mfg. Co. 104
Commercial Trade Institute 104
Connell Co., W. J. ***
Cook Mfg. Co., Inc., C. Lee 44
Cooper-Bessemer Corp., The ***
Cummings Engine Co. ***
Cuno Engineering Corp. 7

De Laval Separator Co. 39
Delco Products Div., Gen. Motors Corp. 36
Delco-Remy Div., Gen. Motors Corp. ***
Detroit Diesel Engine Division, General Motors Corp. 6
Diesel Corp. of N. J. ***
Diesel Injection—Sales & Service ***
Donaldson Co., Inc. ***

Electric Auto-Lite Co., The ***
Electric Storage Battery Co., The 48
Electro-Motive Division, General Motors Corp. 12
Electro Products Laboratories 95
Ellwood City Forge Co. 96
Enterprise Engine & Machinery Co. 30, 31
Erie Bolt & Nut Co. 88

Fairbanks-Morse & Co. 15
Federal-Mogul Corp. ***
Fitzgerald Mfg. Co. ***
Fox & Co., Inc., M. Ewing ***
Fram Corp. ***
Fulton Iron Works ***

General Electric Co. ***
General Motors Corp., A C Spark Plug Div. ***
General Motors Corp., Delco Products Div. 35
General Motors Corp., Delco-Remy Div. ***
General Motors Corp., Detroit Diesel Engine Division 6
General Motors Corp., Electro-Motive Division 12
General Motors, Harrison Radiator Division ***
Golten Machine Corp., Sigurd ***
Gulf Refining Co. 19

Hancock Machine Co., Inc. ***
Harnischfeger Corp. 22
Harrison Radiator Div., General Motors Corp. ***
Hercules Electric Machinery & Equipment Co. ***
Hilliard Corporation, The 103
Honan-Crane Corp. 84
Hunt-Spiller Corp. 42

Illinois Testing Laboratories, Inc. 18
Ingersoll-Rand Co. ***

International Harvester Co. ***

Johnson Bronze Co. ***

Kent-Moore Organization, Inc. 10, 11
Kiene Diesel Accessories, Inc. 97, 99, 101
Koppers Co., Inc., American Hammered Piston Rings Dept. 16

Lanova Corp. 97
Leece-Neville Co. ***
Link-Belt Co. 23
Liquidometer Corp., The 105
Lister-Blackstone, Inc. ***
Lubal, Inc. 105

Madison-Kipp Corporation 28
Manzel ***
Maxim Silencer Co., The 85
Mid-Continent Petroleum Corp. ***

National Metal & Steel Corp. 104
National Welding & Grinding Co. ***
Nife, Inc. ***
Nordberg Mfg. Co. ***
Nugent & Co., Wm. W. ***

Oakite Products, Inc. 86

Penn Electric Switch Co. 83
Penn Flexible Metallic Tubing Co. ***
Pickering Governor Co., The 37
Powers Regulator Co. 14
Pritchard & Co., J. F. ***
Purolator Products, Inc. 20

Quincy Compressor Co. 100

Read Standard Corp. ***
Reiner & Co., John ***
Rochester Mfg. Co. ***
Rockford Clutch Div., Borg-Warner Corp. ***
Roper Corp., George D. ***

Safety Seal Piston Ring Co. 24
Schoonmaker, A. G., Inc. 105
Scintilla Magneto Div., Bendix Aviation Corp. 17
Sebastian Diesel Equipment Co. ***
Sealed Power Corp. ***
Sharples Corp., The 32
Shell Oil Co. 8, 9
Sims, J. Bryan ***
Sinclair Refining Co. 34
Smith Co., Inc., E. R. 105
Snap-on Tools Corp. 90
Socony-Vacuum Oil Co., Inc. 46
Specialties Service & Engineering Co., Inc. ***
Standard Oil Co., Inc. (California) 26
Standard Oil Co. (Indiana) 4th Cover
Sterling Engine Co. 4
Synchro-Start Products ***

Teach & Co., B. J. ***
Texas Company, The 2nd Cover and 3
Thomas Flexible Coupling Co. 88
Tickle Engineering Works, Arthur 86
Tide Water Associated Oil Co. 41
Trane Co., The ***
Tubing Appliance Co. 100

U. S. Hoffman Machinery Corp. ***
Utilities Engineering Institute 105

Van der Horst Corp. 99
Van Norman Co. ***
Viking Pump Co. 98
Vogt Machine Co., Henry 33

Waukesha Motor Co. 81
The Weldize Corp. 95
Western Gear Works ***
Wildermouth, Inc., E. A. ***
Winslow Engineering Co. 21
Woodward Governor Co. ***
Worthington Pump & Machinery Corp. ***

Young Radiator Co. 25

Zallea Bros. Third Cover

Zallea Expansion Joint News

PUBLISHED BY ZALLEA BROTHERS—WORLD'S LARGEST MANUFACTURERS OF EXPANSION JOINTS EXCLUSIVELY

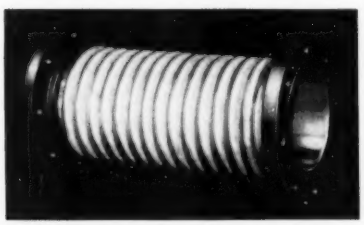
Expansion Joint of the Month

The "Why" of Lateral Movement

WHEN ACTIONS SPEAK LOUDER THAN WORDS

The "proof of the pudding" for any piece of equipment rests on its performance, based on everyday use under all conditions. In plants where dependability of equipment is a must, you'll find Zallea Flexible Connectors installed for full assurance of top performance—and for these six good reasons:

- Annular corrugations permit greatest flexibility—maximum durability—longest service life.
- Torsional strains are eliminated by action of parallel form of corrugation.
- Great axial as well as lateral movement.
- Flexibility enables bending to a minimum radius of twice the diameter.
- No seams or joints to open.
- No packing required—permanently gas tight.



Zallea Flexible Connectors are available in diameters from 4" to 72" with flanged or welding ends or a combination of both . . . to handle exhaust temperatures in excess of 750°F.

. . . a brand new 4-page folder on *all* Zallea Expansion Joints. Send for your copy of Bulletin 351 today!

ZALLEA BROTHERS, 812 Locust Street, Wilmington 99, Delaware.

THE ordinary corrugated bellows of the past has not been very satisfactory for applications requiring lateral deflection, i.e., at right angles to the axis of the joint. This was due to the fact that very little study has been given to the manner in which an expansion joint is stressed when subjected to lateral movement. The tendency has been to assume that a corrugated joint could be displaced laterally some nominal amount such as 1/16" or 1/8" for each corrugation. This fallacious assumption has resulted in considerable overstressing and early failure of the joint.

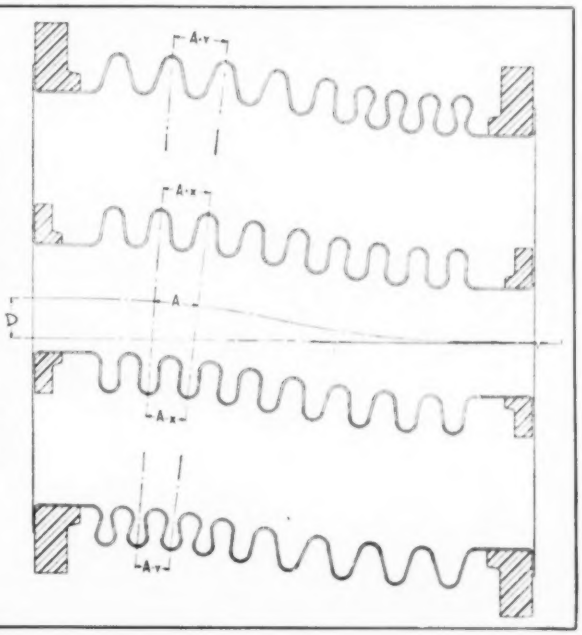
Lateral Displacement Two Ways

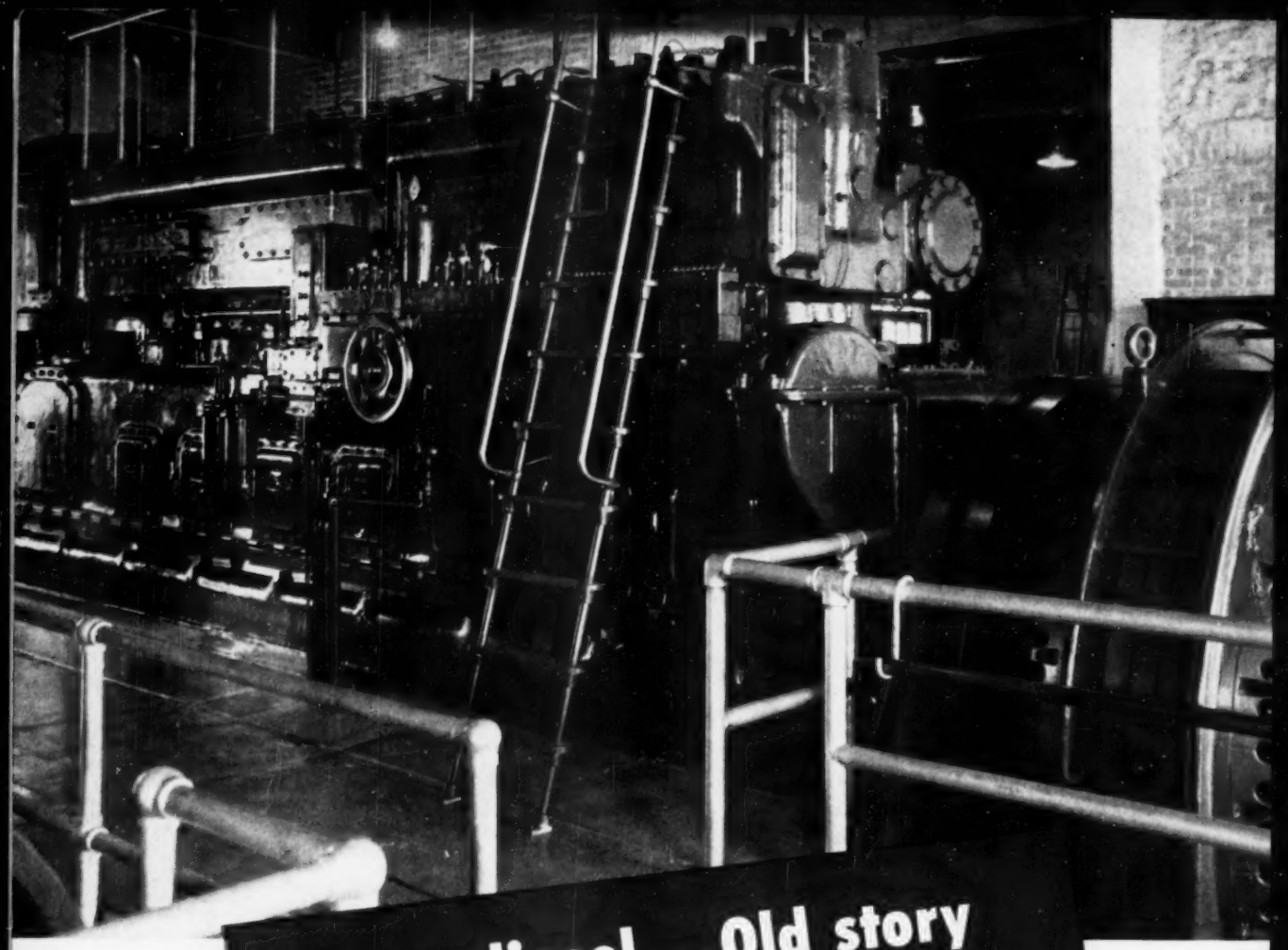
There are two ways in which an expansion joint can be subjected to lateral displacement. The first is by angular rotation in which one flange remains fixed and the other flange is rotated out of parallel with the other. This condition is unusual and only occurs when expansion joints are used in pairs. The second is the usual case in which an expansion joint is *offset* laterally, while the flanges remain parallel. If a corrugation is compressed or stretched without stressing the metal beyond the elastic limit, it will always return to its original shape. The amount that a single corrugation may be displaced without exceeding the elastic limit is called the "spring rate" per corrugation, and depends on the thickness of metal and the shape and depth of the corrugation. In lateral movement, it is highly desirable that all corrugations function within the elastic limit so that distortion will be minimized and high stresses will not be developed in individual corrugations.

"Spring Rate" Is Important

When an expansion joint is displaced laterally, it assumes the shape of a simple offset bend and the corrugations on the outside of the bend open, while those on the inside close. The amount of this opening and closing should not exceed the "spring rate". As more corrugations are added, more lateral deflection can be absorbed. However, as the diameter of the joint is increased, the lateral deflection which can be absorbed per corrugation is reduced. Thus it is seen that if the rule of thumb formula, such as 1/8" lateral deflection per corrugation, is applied, the larger joints would have to be excessively distorted to permit such lateral movement. Such joints would fail in short time due to abnormally high shear stresses.

The smaller expansion joint shown here can be deflected laterally for a distance "D" without exceeding the free spring rate "X". However, if a larger joint is deflected the same amount, the corrugations must open or close a distance "Y", which is excessive and will permanently distort the expansion joint — resulting in early failure.





New diesel...Old story

• When the city of Garnett, Kansas, placed this 1,400-HP diesel in service in the municipal power plant early in 1948, STANDARD HD Oil was the logical choice for a lubricant. The superior performance of Standard fuels and lubricants was already an old story to operators at Garnett, since they had been used for over 20 years in the plant's other generating equipment. One diesel, for example, has logged over 70,000 hours and is still running with the original pistons. A set of rings consistently delivers over 20,000 engine hours.

Since installation of the new equipment, lubrication has been trouble-free and exceptionally economical with consumption averaging better than 9,000 HP-hours per gallon of lubricant consumed.

A Standard Oil lubrication specialist can help put STANDARD HD Oil to work to your advantage in your own diesels. For his services, call the Standard Oil Company office in your own area, or write: Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD HD
TRADE MARK
OIL

STANDARD OIL COMPANY

STANDARD *(Indiana)*